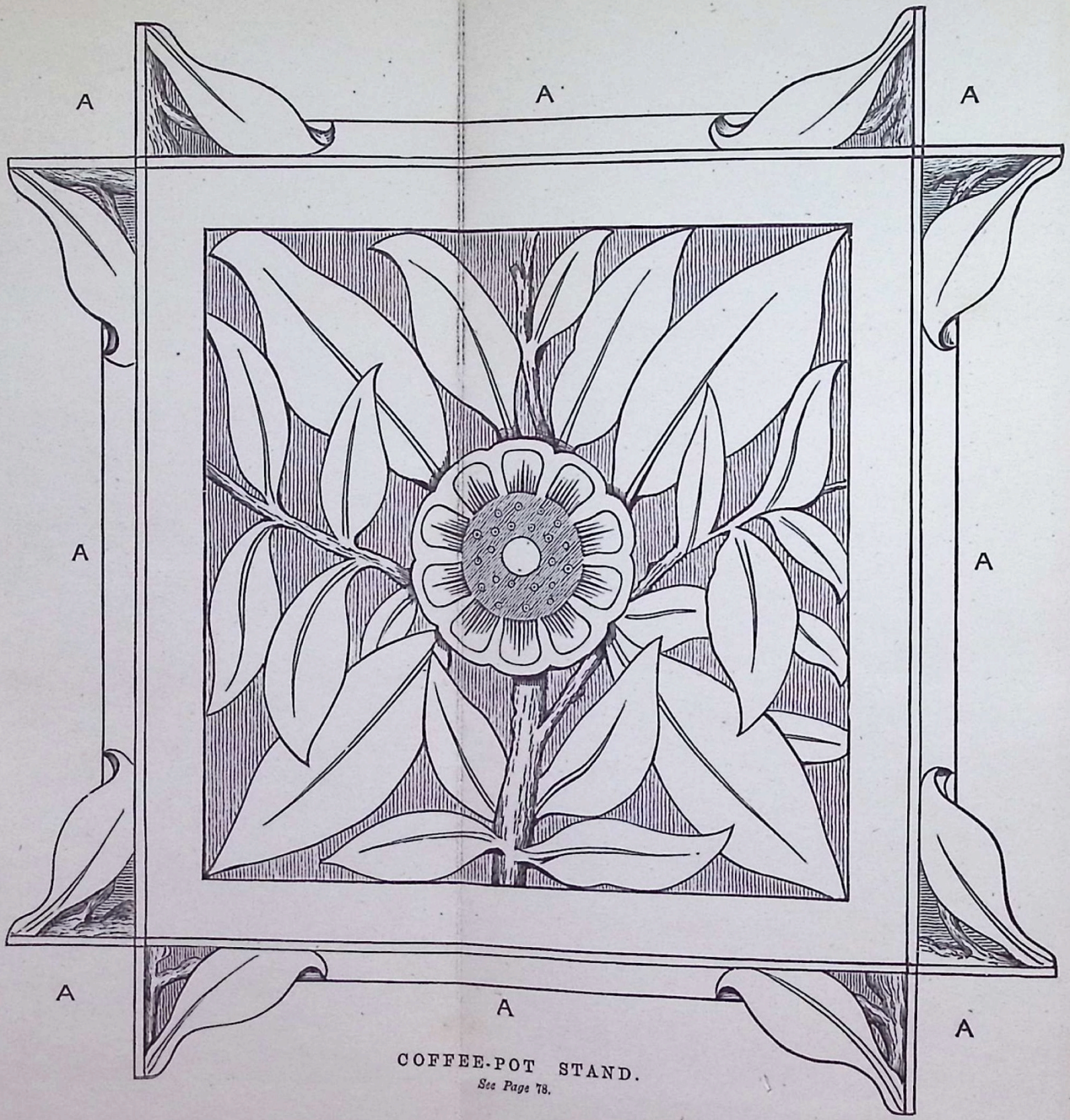
Repoussé Work for Amateurs

REPOUSSÉ WORK FOR AMATEURS.



COFFEE-POT STAND.

See Page 78.

REPOUSSÉ WORK

FOR AMATEURS:

BEING THE ART OF ORNAMENTING THIN METAL WITH RAISED FIGURES.

By L. L. HASLOPE.

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PREFACE.

IN these days, when "of making books there is no end," and every description of work, whether professional or amateur, has a literature of its own, it is strange that scarcely anything should have been written on the fascinating arts of Chasing and Repoussé Work. It is true that a few articles have appeared in various periodicals on the subject, but with scarcely an exception they treated only of Working on Wood, and the directions given were generally crude and imperfect. This is the more surprising when we consider how fashionable Repoussé Work has become of late years, both here and in America; indeed, in the latter country, "Do you pound brass?" is said to be a very common question. I have written the following pages in the hope that they might, in some measure, supply a want, and prove of service to my brother amateurs.

It has been hinted to me that some of my chapters are rather "advanced;" in other words, that I have gone farther than amateurs are likely to follow me. I do not think that this is the case, for amateurs are a very enterprising class,

and seem to think nothing beyond their range. When one sees them attempt organ building, and even the manufacture of violins, I do not consider that there is anything in what I have written that need deter them. At all events, I have described nothing that I have not done myself; and I would remind them of the proverb—"What man has done, man may do."

L. L. H.

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REPOUSSÉ WORK

FOR AMATEURS.

INTRODUCTION.

To climb steep hills
Requires slow pace at first.
—*Shakespeare.*

Antiquity of the Art of Working in Metal—The Bible and Metal-work—Abundance of Gold and Silver in Ancient Times—The "Original Home" of Metal-work—Metal-working in India, Spain, Damascus, Greece, and Italy—Benvenuto Cellini—Metal-working in England—Repoussé Work: Definition of; Revival of; Within the scope of Ladies; An Endless Source of Amusement and Pleasure to the Amateur; An Employment for the "Young Hopeful"—Ready Sale of Repoussé Work at Bazaars—An Elegant Occupation—Little Plant Required—A Knowledge of Drawing not Absolutely Necessary—My Introduction to the Art—Difficulty of Obtaining Tools—Where Tools and Materials may be Purchased—Where Lessons are Given.

THE art of working in metal appears to have been known from the earliest ages. The first record we have of its being practised

is in Holy Scripture, where Tubal Cain (who is supposed to have lived about 3504 B.C.) is described as an "instructor of every artificer in brass and iron." This appears to show that metals were very commonly used in his day, and also, no doubt, long prior to it. The earlier books of the Old Testament teem with allusions to work in metal such as I am about to describe. The first mention of the precious metals being used for the purposes of ornamental art is when Abraham's servant is said to take "a golden earring, of half a shekel weight, and two bracelets for her (Rebekah's) hands, of ten shekels weight of gold." (The gold shekel was worth, according to our present currency, about £1 16s. 6d.)

Numerous other references are made in these books to various articles, for ornament as well as use, worked out of the precious metals, such as rings, chains, crowns, bowls, cups, hooks, pillars, candlesticks, tongs, &c.; and in the directions given for the Mercy Seat in the Tabernacle, and the Cherubims that were to surmount it, it is expressly stated that they were to be made of "beaten gold." Hammers and graving tools are recorded as having been used; so that the process of forming the metal into the required shape was doubtless very similar to that in use in the present day.

Gold and silver appear to have been much more abundant in those days than they are at present, as we read that all King Solomon's drinking vessels were of gold—"none were of silver; it was nothing accounted of in the days of Solomon." It is also stated that he received 666 talents of gold in one year—nearly equal to twenty-seven tons in weight. We cannot but marvel as to what has been done with all this wealth.

As the East was the original home of metal-work, so it has continued ever since to produce most skilful workers, not only in the precious, but also in the baser, metals. India especially yields some beautiful specimens of work, and its natives are

justly celebrated for the originality and skill they bring to bear upon it, though all their appliances are of the rudest and most primitive description. With only a charcoal stove, a lump of clay, a blowpipe, hammer, and a few small tools to aid them, they will produce work not to be surpassed by those having at their command all that Western civilisation can give them. The chief centres of Indian work are: Kurtch, where very beautiful silver work is made, chiefly beaten down from the face; and Benares, celebrated for its brass trays, vases, &c., ornamented with chased work, often of very quaint and curious design. A great deal of work is also done, both in brass and silver, at Dinapore and Delhi. Persian work is accounted very beautiful, but partakes more of the character of inlaying than of chasing.

In Spain, and along the shores of the Mediterranean, a collector of works in brass will find an excellent field for his labours. The brass industry of Damascus, always large, is said to be increasing, and trays, aiguières, and other articles, many of them of great beauty, are produced there in large numbers.

Some of the most exquisitely-finished specimens of art, as applied to metals, have been produced in Greece and Italy. Articles of great beauty were found among the ruins of Pompeii, and are preserved in the Museum at Naples; these still serve as models from which the Italian jewellers work.

The mention of Italian art would be incomplete without some notice of one of its most skilful artists, Benvenuto Cellini, who flourished in the middle of the sixteenth century. He was apprenticed to a jeweller, and for many years worked exclusively on metal. Many highly artistic vases, chalices, &c., wrought by him, are to be found in the churches and museums of his native land. In his later years he worked in bronze and marble. His most important work is a statue in bronze of Perseus holding the head of Medusa in his hand.

In our own country, for many years art was at a very low ebb, and a great deal of most inartistic work was produced. Owing mainly to the efforts of the late Prince Consort, and the establishment of art schools, the tide has now turned, and our metal manufactures have assumed a totally different character, and no longer offend the eye of the artist; indeed, some of the work produced by Messrs. Elkington & Co., Birmingham, and also by the principal metal-workers of London, rivals any that has come from abroad.

I strongly recommend any of my readers who intend to take up this fascinating art to examine carefully the collections of metal-work at the British and South Kensington Museums; in both these places specimens of the highest character will be found, which will be of great service in the study of metal-working. They should not be satisfied with a mere casual inspection, but should spend much time in studying the characteristics of the various styles, and thereby acquire a real knowledge of what they are about to undertake.

Having given a slight sketch of metal-work past and present, we will now consider more fully the particular branch of it under notice.

The word Repoussé means, literally, "beaten back," and is applied to the art of ornamenting thin metal with raised figures. The process is a twofold one: The outline is first chased on the face of the work, by means of a hammer and small tools, and the figures are afterwards raised by beating the metal up from the back. The work has met with a very warm reception; and it is not strange that it has done so, as, in its various forms, it meets the requirements of so many classes of amateur workers.

In the first place, the work is quite within the scope of ladies, especially if we except some of the rougher parts of it, which they will have no difficulty in getting done for them.

They soon become proficient at it, owing, no doubt, to their delicacy of touch and refinement of feeling. Of course, it adds an additional charm if they are able to design their own patterns. To the amateur already skilled in mechanics it forms a never-ending source of pleasure and amusement—designing patterns, inventing and forming the articles, and ornamenting them afterwards, will give him most agreeable occupation for his leisure hours; moreover, he is not likely to tire of it, as, however good his work may be, there always remains something more to be attempted. And even "young hopeful," home for the holidays, who, tired of teasing his sisters, worries his "forbears" for "something to do," may be set down before a block of wood and a piece of sheet brass, to work away with a hammer and a French nail; and though the result may not quite equal one of Cellini's masterpieces, still he will be kept out of mischief for a time, and this small beginning may develop a taste for the fine arts which may be valuable to him hereafter.

Those who are fond of helping forward any good work within their reach will find this an excellent means of doing so, as I know nothing that meets with a readier sale at bazaars than brasswork *en repoussé*, particularly if it is carefully and well done. As a means of increasing a small income I cannot speak with the same confidence; manufacturers are not likely to purchase it, as they can readily obtain anything they want from chasers who have served a long apprenticeship to the trade, and who will supply them on very low terms. Another reason, also, is that, though the amateur may very quickly attain to a considerable measure of success, it will take a great deal of hard labour and much experience before he will be able to turn out his work as a professional does.

Taken in the light of an elegant occupation, I know nothing equal to this art; and so great are the decorative qualifications

of artistic brasswork, that it enables us to ornament our homes with great ease, and at a trifling cost. It "goes well" with almost everything, especially with the mediæval style of furnishing so much in vogue in the present day; nothing lights up a room more than brasswork judiciously hung on the walls.

Another great advantage is, that the work may be carried on almost anywhere, as no "plant," so to speak, is required; all the appliances can be easily taken, as required, to some convenient spot for working, and removed again when done with. In fact, this work can be taken up and laid down just as the amateur's fancy or convenience may dictate.

My attention was first called to this art, a few years ago, by seeing, at a local exhibition, a brass tray made by a lady with very simple tools; of course, it was rough and unfinished, but that it was artistic could not be denied. It was considered sufficiently good by the judges to merit the reward of a silver medal. The tray was afterwards sold for £2 2s. I just mention this instance as an encouragement to my readers, and to show how much may be done with small appliances. As designs may easily be procured and traced off on to the metal, a knowledge of drawing is not absolutely necessary; though, of course, those persons will succeed best who are most skilled with the pencil, and who have the most feeling for the beautiful.

Having once made up my mind to turn my hand to metal-working, I never rested until I had made myself master of it. I soon found that it was not to be learnt through ordinary channels—in fact, that it was a trade secret, and one very difficult to get a knowledge of. Even the tools could not be purchased at the tool shops, it being part of the business of the workmen to make them for themselves, as the necessity for them arose. It would, probably, only weary my readers if I were to

recount all the obstacles I met with at every turn; suffice it to say, I succeeded at last, and hope in this work, by going systematically and carefully through each process, from the simplest to the most difficult, to remove the obstacles that would be otherwise met with, and to smooth the path to the goal of success. I am quite aware that the task is not an easy one; it is one thing to do a thing yourself, and quite another to teach on paper the method of doing it, and particularly so in this case, where a slight motion of the wrist, or a movement of a finger, may make or mar the work. I propose from time to time, as descriptions of them occur, to indicate the places where special tools or appliances, not readily obtainable at ordinary shops, may be purchased; but I may just say here, that Mons. A. François, Ryland Road, Birmingham, supplies amateurs with all requisites. I can also specially recommend Mr. T. J. Gawthorp, of 16, Long Acre, London, whose quaint little shop, in the Old London Street, at the "Inventories," will doubtless be remembered by many of my readers. He not only provides materials, tools, and all the appliances required for the art, but gives lessons to amateurs, and finishes their work in any style required. Though in the succeeding pages I shall endeavour to show my readers how each part of the work is done, and to put them in the way of doing it for themselves, I cannot but feel that they would gain their object much quicker, and more satisfactorily, if they were to have a few lessons, and entrust the rougher part of the work to Mr. Gawthorp's skill and experience.

CHAPTER I.

MATERIALS.

Metals usually Employed—Gold: Facility of Working; Purchasing; Relative Values of—Silver: Malleability and Ductility of; Standard; The Best Metal for the Chaser's Art—Copper—Brass: Inclusive of Copper and Spelter; "Rolled"; "Brazing Metal"; "Gilding Metal"—Britannia Metal—Pewter: Not to be Recommended for the Amateur's Use—Lead: Suitable for taking Patterns of Tools—Iron: Difficult to Work—Brass: Recommended to Amateur Workers.

Before commencing any work, it is desirable to have a knowledge of the materials employed; I therefore give some account of the metals most suitable for Repoussé Work, noting the principal peculiarities of each of them, so far, at least, as concerns that work.

The metals usually employed for chasing and working *en repoussé* are gold, silver, copper, brass, Britannia metal, pewter, lead, and iron.

Gold, not only on account of its intrinsic worth, but also because of the facility with which it can be worked, owing to its great malleability and ductility, is in great esteem with metal-workers, and is largely used for the finest work, where expense is not an object. Some of the best specimens extant of the chaser's art are in this metal. In purchasing gold, it

should always be borne in mind that the quality varies greatly. Gold in its pure, or fine state, is not employed for many purposes in the arts, as it is too soft to stand the wear and tear of ordinary use; it therefore becomes necessary to incorporate some other metal with it, to give it the required degree of hardness and durability. The gold used by dentists for stopping teeth is as nearly pure as possible, the alloy mixed with it amounting only to the one-thousandth part.

Fine, or pure gold, is supposed to contain twenty-four equal parts, called "carats." When two parts of alloy are added to twenty-two parts of fine gold, the resulting mixture is said to be 22 carats fine; and so on, in accordance with the quantity of alloy used. 22-carat gold is not greatly used by the jeweller, as it is rather too soft for his purpose; its principal use is for the coin of the realm. 18-carat gold is the next quality in general use; this is very malleable and ductile, and can be readily made to take any form under the hammer.

Gold of a lower quality than this is not allowed to receive the Hall mark. 15-carat gold is also much used, especially for jewellery, and can be worked with great facility. Gold much below this quality can hardly be considered as gold at all, though it is used as low as 7-carat—that is, seven parts of gold to seventeen parts of alloy. The alloys used for gold are copper, silver, and zinc, or spelter, as it is called. One rather curious peculiarity of gold, which is not generally known, is that it is green when seen by transmitted light; it also appears of a brilliant green colour when in a state of fusion. The following Table will give some idea of the relative values of the different qualities of gold:

Gold	24	carats	fine	is	worth	£4	5s. 0d.	per oz.
„	18	„	„	„		£3	3s. 9d.	„
„	15	„	„	„		£2	13s. 1½d.	„
„	9	„	„	„		£1	11s. 10½d.	„
„	7	„	„	„		£1	4s. 9½d.	„

Silver.—This beautiful metal is of a purer white than any other. It is capable of a very high polish; so much so, that it was used by the ancients for mirrors before the discovery of glass. It is extremely malleable and ductile, and can be extended into leaves not exceeding the ten-thousandth part of an inch in thickness, or drawn into wire much finer than a human hair. Standard silver (of which our silver coins are made) consists of pure silver, 11·10, and copper, 0·90. No silver of inferior value to this can be Hall-marked. Though silver is harder, it is also tougher, than brass, and is a most agreeable metal to work upon. Indeed, take it all together, I consider it the best metal for the chaser's use.

Copper.—This is the only metal, with the exception of titanium, that has a red colour. It is tough, very malleable and ductile, and can be easily forged with the hammer. Where the colour is not objected to, it is, on the whole, a suitable metal for Repoussé Work.

Brass.—A great number of alloys of copper and spelter are included under the generic name of brass. It would only be tedious to my readers if I were to dwell upon them all. I will, therefore, at once say, that the best for chasing and Repoussé Work is the ordinary "rolled brass"; this contains sixteen parts of copper and eight parts of zinc. This alloy, being easily fusible with the blowpipe, is not well adapted for work that has to be brazed; if the work requires hard soldering, a harder brass, containing more copper and less zinc, should be used. A good proportion is—copper, sixteen parts, and zinc, six parts. This mixture, called "brazing metal," works as well under the hammer as the ordinary rolled brass, though the colour is not quite so good. Another description of brass, much used by the makers of common jewellery, is called "gilding metal"; this has a fine colour, somewhat between yellow brass and copper, and can be made to look very much like gold.

Britannia Metal.—This is an alloy of tin, and is a useful addition to the amateur's stock of materials. It chases easily, and with care beats up well. It will take a fair polish, but unfortunately does not retain it long; this disadvantage can be got over by having the work plated after it is finished. It is not difficult to obtain the same class of articles in Britannia metal that are made in silver, such as sugar tongs, napkin rings, spoons, forks, cups, &c. Any of these would form good practice before commencing on the precious metals. The amateur would also learn how to work on curved surfaces, which is somewhat difficult at first.

Pewter.—An alloy of tin and lead, not much used now for chasing. Indeed, I should hardly have thought of mentioning this metal here, had I not seen some exquisite specimens of chasing on it at the South Kensington Museum. If I remember rightly, these were executed in the sixteenth century. Pewter is soft, easily damaged, and will not take a high polish; I cannot, therefore, recommend it for the general use of the amateur. It is usually cast into form, and would, I apprehend, be with difficulty obtained in sheets. Pewter cups are often given as prizes for rowing and other athletic contests, and there is no reason why any of my readers who may have been fortunate enough to win one should not try his hand at chasing and beating it.

Lead.—This metal is very soft, and, taking no polish, is of very little use for chasing, though, at the same time, it is a convenient material for taking patterns of tools, and keeping a register of designs for future use. I have several pieces of thick sheet lead, 6in. by 4in., on which I chase patterns of borders, &c., as I meet with them, and these I find very useful for reference.

Iron.—Very beautiful work has been done in this metal; but, as it is hard, and, consequently, difficult to work, it is not very suitable for an amateur's purpose.

Having mentioned some of the peculiarities of the metals most suitable for Repoussé Work, I will now close this branch of my subject by saying, that I would strongly recommend the amateur commencing to work *en repoussé* to go through a course of working on brass before he attempts to work on any other material. This metal has the merit of being cheap, and easily procured; it is tough, will take a good polish, and may be beaten up to almost any height. The work, also, when well finished, has a most artistic appearance. Though one can hardly imagine an amateur rash enough to commence on the precious metals, there is nothing to prevent his ultimately using them; indeed, it seems almost a pity to put really first-class work on anything else. I may add, that all the directions given in the succeeding chapters, except where otherwise indicated, apply equally to the precious as well as to the baser metals.

CHAPTER II.

APPLIANCES.

Appliances Few, Simple, and Inexpensive—Bench—Cushion—Wood Block—Lead Block—Pitch Block—Chaser's Bowl—Pitch Pan—Anvil—"Sad Iron"—Pitch Kettle—Ladle—Stove—Fletcher's Burners—Stool for Stove—Buff Board—Buff Leather—Loose Sleeves—Apron.

THE appliances required for Repoussé Work are few, simple, and inexpensive. A **Bench,** or steady table, on which to work, is of course necessary, and needs no description; it should be placed in front of a window, as a good light is most desirable.

Cushion (Fig. 1).—This is a soft ring, on which is placed the block to which the chaser's work is fixed. It serves to

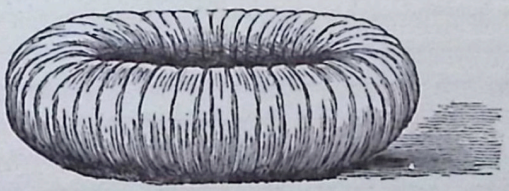


FIG. 1. CUSHION.

lessen the concussion and noise produced by the blows of the hammer, and also to raise the work to a convenient height; this latter is a matter of some importance, for, if

the work be too low, the chaser cannot see the edge of his tool, and in consequence cannot direct it aright. The best position is when the top of the block is raised to about the level of the middle of the chest of the workman sitting before it. I am now speaking of the best height for chasing; for beating up, the block is better lower, as the effect of the blows can be more easily discerned. The cushion also enables the work to be readily turned in any direction, to suit the chaser's convenience.

Anyone can make a cushion for himself; it merely requires, for a foundation, a ring of iron, 7in. across and ½in. thick; this is wrapped round with strips of rag until the thickness of the ring is increased to something like 2¼in. or 3in. Flannel list is a still better material to use for thickening up the ring, and makes a nice elastic cushion.

Wood Block.—This is only used for the most primitive work, and is merely a piece of wood, of any convenient size, the larger the better, and about 2½in. or 3in. thick. The quality of the wood is not of much importance, but I should use beech or sycamore for choice, as these woods are close-grained, and stand the hammering better than a softer wood.

Lead Block.—A piece of wood similar to the above, with a square sheet of lead, ½in. thick, screwed down upon it. There should be a screw at each corner, and the heads of these screws should be countersunk—that is, let in to the level of the block, so as to be out of the way of the work to be beaten. The amateur can easily cast the lead for himself by using for a pattern a smooth piece of board of the required size; mine is 10in. by 9in. This should be carefully pressed into some casting sand, and the sand well rammed all round. A straight piece of wood should then be drawn over the pattern, which can be lifted out of the mould by two French nails lightly driven into it. The lead may now be poured into the mould from a

ladle. Care should be taken to level the pattern when it is in the sand, or the sheet of lead will be thicker in one part than in another.

Pitch Block.—We now come to the most useful appliance a chaser has, and without which no really good work can be done. Professionals generally use a stone slab as the basis of their pitch blocks, the size of which is regulated by the dimensions of their work. Any kind of stone will answer the purpose, provided the surface is tolerably smooth. It should be about 1in., or rather more, in thickness. Suitable stones can generally be procured from any stonemason; an old lithographic stone, 18in. long by 13½in. wide, and 1¼in. thick, is a great favourite of mine; I can work any plate up to about 10in. wide on this. A common brick, even, may be used occasionally for small work.

Chaser's Bowl.—This appliance is much used by workers in the precious metals for small articles, and particularly for those having curved surfaces. It is made of cast iron, and greatly resembles half a cannon-ball, hollowed out in the centre. It is filled with melted pitch, and the work fastened down upon it in the same way as it is on the pitch block. When placed on the cushion, the convex surface of the bowl fits into the centre of the cushion, and makes a most convenient arrangement, as the ball and socket contact allows the work to be turned with ease in every direction, not only horizontally, as in the case of the pitch block, but almost, if not quite, vertically, as may best suit the work in hand.

Pitch Pan (Fig. 2).—This, another arrangement for supporting the pitch, consists of a shallow pan, filled with pitch, and will, perhaps, be found by ladies in some respects more convenient than the stone slab, as it is lighter to move about, and, having a handle at each end, is easier carried; it is not, however, as steady as a stone block. On an

emergency, a common baking-tin, to be procured of any ironmonger, might be used. In order to try the pitch pan, I have myself beaten up a crumb-tray on it, and found it to answer the purpose very well, though, in a general way, I very much prefer stone. If any of my readers elect to use a

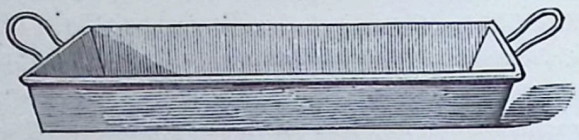


FIG. 2. PITCH PAN.

pan for their pitch, I should recommend their having one made of sheet iron, galvanised, with the corners turned up and riveted by a tinman; it should be 1½in. deep, and sufficiently large in length and width to allow of a good margin round the work.

Anvil.—A small anvil with a good surface is very necessary for the Repoussé worker. The chaser from whom I learnt the art used a common flat iron, or, as it is sometimes called, "sad iron," and exactly the same as laundresses use for ironing linen. I do not think that anything could answer the purpose better. If the handle be cut off with a cold chisel, it can be used on the workman's bench; but if the handle is left on, it must be held in a vice.

Pitch Kettle (Fig. 3).—This, the same kind of kettle as used by plumbers for melting their lead, is made of cast iron, and is required for melting the pitch; it is readily obtainable at any ironmonger's. A useful size is one about 8in. across the mouth, and about 7in. high. A plumber's ladle, about 5in. across the top, made of wrought iron, is also necessary for ladling out the pitch from the kettle.

Stove.—All the operations I shall describe, except lacquering,

can be carried on with the aid of a common fire; but when there is convenience for it, a stove is much handier, and there will be much less probability of capsizing the kettle full of pitch over the floor, a proceeding much to be deprecated. If gas is available, a very simple and perfect arrangement can be made, at a small expense, by using one of Fletcher's Patent

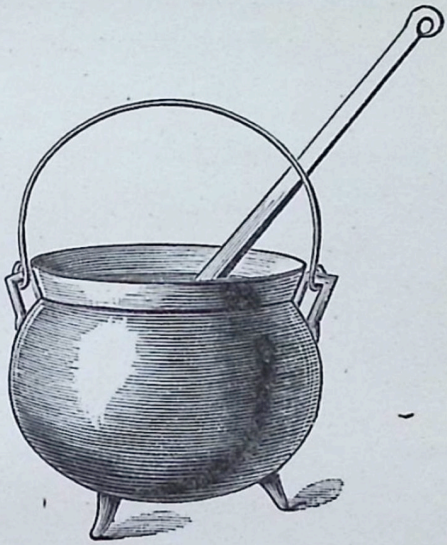


FIG. 3. PITCH KETTLE.

Solid Flame Burners. These can be obtained, of different sizes, from Messrs. Deane and Co., King William Street, London, E.C., or direct from the maker, at Warrington.

If the stove is to be used on an ordinary table, a small iron stool should be made for it to stand upon; this will prevent the table being injured in the slightest degree by the heat of the burner. The upper surface of the stool need not be more than 2½in. above the table. A piece of boiler plate, ¼in. thick, and 1ft. square, is quite large enough to hold the

burner comfortably. The legs should be of ½in. round iron. Fig. 4 shows the stool with the burner on it. Fletcher's burners were originally intended for saucepans and other flat-bottomed vessels, and, consequently, the pitch kettle, having feet, will not stand steadily upon them without further support; the best plan is to have a light square iron frame (11¼in. square, and 6in. high) with four legs (Fig. 5); this is to be placed on the iron stool, over the burner. To insure steadiness

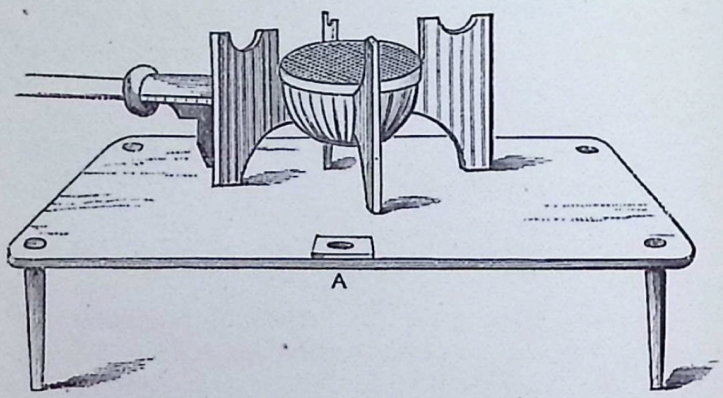


FIG. 4. BURNER ON STOOL.

and stability, it is well to have two sockets (shown at A, in Fig. 4) for two of the legs of the frame to fit into, brazed on to opposite sides of the stool. Fig. 6 shows a simple method for obtaining a supply of gas from an ordinary bracket, without in any way interfering with its original use. The bracket is shown with and without the attachment; the latter can be added by the amateur himself, all that is necessary being to unscrew the pipe at A, screw in the cross-piece containing the taps, and fix the pipe into the end of it; a little stiff white lead, rubbed on to the screws before putting together, will insure their being gas-tight. An indiarubber

tube of sufficient length is slipped on to the tap B, and the other end is attached to the patent burner. Nothing can surpass these burners as a clean, economical, and effective source of heat.

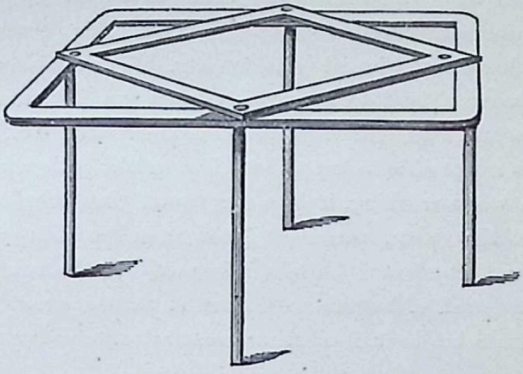


FIG. 5. FRAME TO SUPPORT KETTLE.

If gas is not available, one of the numerous petroleum cooking stoves, now so common, may be used, and will make a fair substitute.

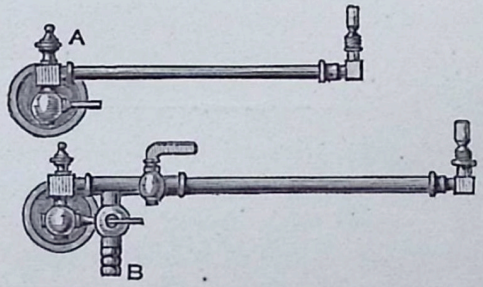


FIG. 6. GAS BRACKETS, WITH AND WITHOUT IMPROVED ATTACHMENT.

Buff Board.—Chasing tools are not ground and sharpened, like ordinary cutting tools, as they are required to be blunt;

still, to turn out good work, it is important that the cutting edges be kept perfectly smooth, and in good order. The best thing to use for this purpose is a piece of buff leather, about 2¼in. wide and 7in. long, glued down on to a piece of wood ½in. larger each way than the leather, and ¾in. thick. A piece of a soldier's old belt answers very well. A little dry crocus should be sprinkled on the board occasionally. If my readers cannot readily procure buff leather, they may get it from Messrs. C. Harris and Son, Bromsgrove Street, Birmingham.

As it is impossible to keep the left arm altogether away from the pitch when working, it is a very good plan to wear a loose sleeve on that arm, made of linen, and reaching to above the elbow. It should have a piece of elastic run into the upper part, and a button to fasten it at the wrist. A linen apron, with a bib to it, is another great advantage for this work.

CHAPTER III.

TOOLS.

Hammer—Chasing Tools: Curved and Straight Tracers—Matting Tools: Pick; Freezing Tool—Border Tools—Cup and Ball Tools—Oval Tools—Repoussé Tools—Tool-holders—Mallet—American Mallet—Snips, or Hand Shears—Spatula—Square—Scriber—Making Chasing Tools: Forging; Filing; Tempering—The Old Blacksmith's Method of Tempering—Tools made with a Graver.

Hammer.—The chaser's hammer (Fig. 7) is a light, handy tool, about 10½in. long, and from ⅝in. to 1in. across the face. Its chief peculiarity is in the handle, which is much thinner than usual, to give it elasticity, and at the end assumes the

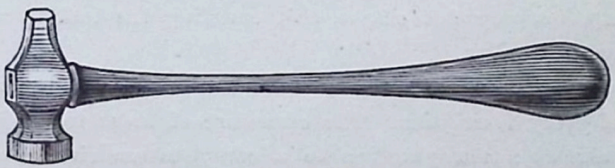


FIG. 7. CHASER'S HAMMER.

form of an egg-shaped bulb, to fit the palm of the hand. Some workmen flatten the sides of this bulb; but this is a mere matter of taste. It is well to have two hammers—a light one for chasing, and another, rather heavier, for beating up.

Chasing Tools.—The number of tools required by a professional chaser is always large, not unfrequently amounting to several hundreds; and the number is continually increasing, special work often requiring special punches to be made before it can be executed. The amateur just commencing need not, however, be alarmed at this, as a great deal may be done with only a few tools, and he can purchase or make more as he requires them; even a professional does the bulk of his work with about a dozen tools. The most important of his tools are the *tracers*. These are chisel-ended tools, the edges being obtuse, and from $\frac{1}{16}$in. to $\frac{3}{8}$in. broad; a medium size is the one mostly in use. The wider ones are principally

FIG. 8. STRAIGHT TRACER.

FIG. 9. CURVED TRACER.

adapted for straight lines. *Straight tracers* (Fig. 8) are made slightly convex on the edge, and with the corners rounded off; perhaps I ought rather to say, that the edge is a section of a very flat ellipse, this enabling the tool to work with great freedom.

Curved tracers are largely used for leaves, and curved lines of every description. The curvature of these tools varies from almost a straight line to a complete semicircle; tools having the latter are mostly used for borders, and for knocking in at one blow scales of fish, &c. A useful form of curved tracer is shown at Fig. 9. For slight curves, one side of the tool is often quite flat, and the other slightly rounded. Chasing tools should not, as a rule, be too thin on the edge, or it will

be difficult to obtain a sufficiently bold outline. A good length for these tools is from 3½in. to 4in.; if they are much longer, they are not so easy to work with, as they are more apt to slip aside when struck with the hammer. My readers will soon find out for themselves that there is a great difference in tracers, and, when they meet with a really good one, will value it accordingly.

Matting Tools.—These are used for filling in the groundwork of the design. The simplest of them is a *pick* (Fig. 10),

FIG. 10. PICK.

a small tool, with a tolerably sharp point; it is used for covering the groundwork with a multitude of fine dots, and is also useful for other purposes, such as putting the light into a bird's eye—indeed, wherever a small spot only is required. For grounding in an ordinary way, more ornamental tools are used, the ends of which are engraved with figures, stars, and other devices. Under this head I may also mention a small punch, called a *freezing tool*, which produces a small star. When the work is closely covered with these, it gives the appearance of frosting, and has a very pleasing effect.

FIG. 11. BORDER TOOL.

Border Tools are rather larger than those already mentioned, and have figures of various kinds engraved on

the ends, which are flat; they are either used by themselves, for corners, or, in combination with other tools, for borders. A pretty pattern may often be made by repeating the figure, either in straight or curved lines. Fig. 11 gives the outline of a punch which is a good specimen of this class.

Cup and Ball Tools.—*Cup, or ring tools,* are circular at the ends, and have their centres hollowed out; therefore, when struck on the work they make a circle. They are required for birds' eyes, beads, and for all purposes where a complete

FIG. 12. CUP AND BALL TOOLS.

circle is wanted; several sizes of them are in use, ranging from $\frac{1}{16}$in. to $\frac{3}{8}$in. in diameter. *Ball tools* are just the reverse of cup tools, their ends being like the half of a ball; they are more often required on the back than on the face of the work. Cup and ball tools should be purchased in pairs (*see* Fig. 12).

Oval Tools.—These are similar to the cup tools, except that they are so shaped as to make ovals instead of circles. They are not in any very great demand, though occasionally useful.

Repoussé Tools.—There is a great difference between these tools and those previously mentioned; they are much larger, and take a variety of forms. Fig. 13 shows one of the largest of them, and one used as often as any if the work is of any size; it is particularly suitable for beating up pears, apples, birds' bodies, and other large surfaces. Fig. 14 shows another tool of the same character, and used for similar, though smaller, figures. Fig. 15 represents a most useful kind of tool, which

is especially valuable for working up the stems of trees, and for this purpose is used with the front corner slightly raised. A chaser's stock of tools should contain several sizes of this kind, as they come in useful for all kinds of designs. A tool or

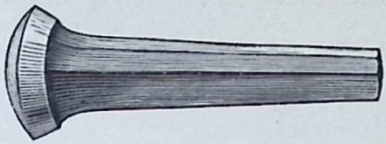


FIG. 13. BEATER.

two with square, flat ends, should also be purchased; these are used on the face as well as on the back of the work.

Tools with oval ends, and slightly rounded on the face, are also most useful in beating up the work; it is well to have several sizes, ranging from $\frac{1}{16}$in. to $\frac{3}{8}$in.

FIG. 14. BEATER.

Tool-holders.—All chasing and Repoussé tools should be sorted, and each kind kept by itself, in a small tool-holder (Fig. 16), or the workman will have considerable trouble in

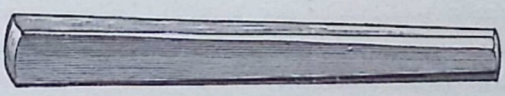


FIG. 15. BEATER.

promptly finding any particular tool he may require. These tool-holders are made of tin, and are $2\frac{5}{8}$in. high, and $1\frac{1}{4}$in. across the top. They are simple in design, and anyone who can solder could readily make one for himself. The piece of tin for the

body is cut out first, and the edge turned over and beaten down. It is then worked with the hand round a stake, or even a piece of wood, and then soldered down the seam; of course, the two edges should overlap a little. The lower edge is then flanged out about ⅛in., to give the solder a better hold

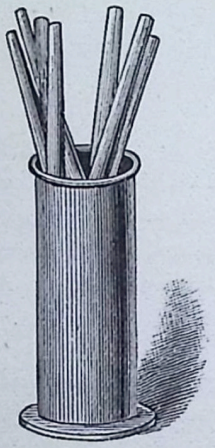


FIG. 16. TOOL-HOLDER.

on the bottom, which is only a circular piece of flat tin, 2in. in diameter, with the edge turned over. As a makeshift, tool-holders might be made of cardboard; but even if the amateur cannot make a tool-holder for himself, he can procure one so very cheaply from a tinman that it is hardly worth his while to have an inferior one.

Mallet.—Fig. 17 shows the form of a tinman's ordinary mallet, which is, in fact, a wooden hammer with a face 2½in. in diameter; it is required for flattening sheet metal before working, as well as in making the different articles out of it afterwards. One end should be rounded, and the other flat, with just the sharp edge taken off. If an iron hammer is

used on the work, it leaves marks, which show when the plates come to be polished. A mallet is easily turned by anyone possessing a lathe. Apple is the best wood for the head, and ash or lancewood for the handle.

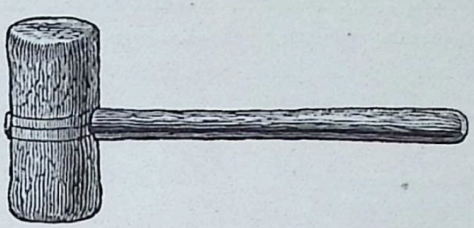


FIG. 17. MALLET.

The Americans, always to the front with new and improved tools, have lately brought out a new form of mallet, specially designed for the use of silversmiths and workers in brass. It is, in shape, like a tinner's ordinary mallet, but instead of being made of wood is formed of raw hide, so that it shall not bruise the metal. It is altogether a most effective tool. These mallets are made in different sizes, to suit different classes of work.

Snips, or **Hand Shears** (Fig. 18) are used for cutting sheet metal. They can be purchased, of any ironmonger, of various sizes. They need not exceed 11in. long, as this size is quite strong enough to cut the metal generally used for

FIG. 18. SNIPS.

Repoussé work. A smaller pair, with curved blades, will be found very convenient for cutting out circular work. It will require a little practice to use them well, particularly if the metal is at all thick; the secret is to grasp them firmly in

the hand, and to press the upper handle outwards with the ball of the thumb; press the lower handle inwards, with the ends of the fingers; this keeps the cutting edges of the blades together. The rivet should not be too tight.

The **Spatula** (Fig. 19) is a chemist's tool, and used by them for spreading plaisters; it comes in very usefully in our work for arranging the pitch round the metal on the block,

FIG. 19. SPATULA.

and saves the fingers greatly. Any flat piece of iron will do as a substitute, so that I look upon this tool rather as a luxury than as a necessity.

Square.—Some sort of square is necessary for squaring the sheets before they are cut. The best one, in my opinion, is the glazier's square (Fig. 20), which can be obtained at any tool shop. It has the advantage of being graduated in inches on the blade, so that the work can be squared and measured at the same time.

Scriber.—The scriber, a piece of steel ground to a sharp point at each end, comes in handy for marking metal; or an etching needle may be used for the same purpose.

MAKING CHASING TOOLS.

As it is distinctly part of a chaser's business to make his own tools, the amateur should, as soon as he has got over his first difficulties, try his hand at it. Small pieces of steel,

roughly forged into shape, and called "brindles," are manufactured and sold for the purpose. The chaser heats the end red hot, and then forges it into whatever shape he requires. For instance, to make a tracer he would select a piece of steel about ¼in. square, bring the end to a bright red heat, and then quickly flatten it by hammering it on the anvil. Of course, it must be held during this operation with a pair of small tongs or pliers; being small, it soon cools, and may

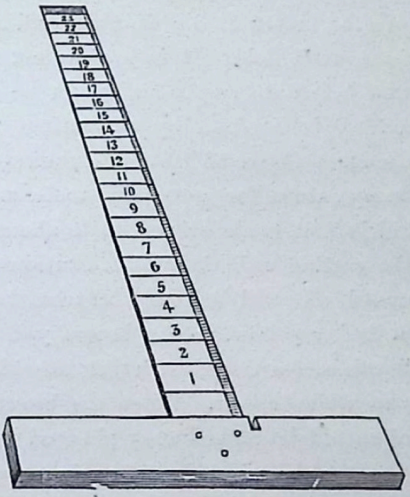


FIG. 20. SQUARE.

have to be heated again. Having got it roughly into shape, he then either grinds or files it until it is exactly the shape required. It is then rubbed up on the oil-stone, until all the file marks are removed. The tool is now made, but cannot be used, as it is too soft to cut the metal; it must, therefore, be tempered.

Tempering involves three processes: (1) Heating; (2) Cooling; (3) Tempering, or letting down. Fletcher's burners,

already mentioned (p. 18), serve the purpose of heating admirably, and the tool has merely to be held in the flame until it comes to a bright red heat. The cooling medium varies according to the class of work, or the fancy of the workman; oil, water in various states, mercury, and even cold iron, have all been used. The watchmaker plunges his tool, as soon as it leaves the flame, into a tallow candle, and, if the tool we are making is a small one, we cannot do better than follow his example; if it is larger—say a ¼in. tracer—it would be better to dip it quickly into cold water, keeping it there until cold. It is now as much too hard for work as it was before too soft, and must be let down to a proper temper. This is done by re-heating, and cooling it again when the exact degree of heat is reached; 500degs. Fahr. is the right temperature for percussive tools, and is arrived at thus: The tool is first made bright up to about 1in., or rather more, from the cutting end; it is then cautiously heated, and carefully watched. It will be found to turn, first a pale straw colour, then a darker yellow, then a brown yellow; at the next stage the yellow becomes tinged with purple, which gets darker, until it turns to a blue colour. When the brown yellow shows itself, the tool should be immediately plunged into the cooling medium, as exactly the right heat has been reached. I was taught tempering many years ago by an old blacksmith, who, I am sorry to say, had strong poaching proclivities. He used to say: "You should just bring it up to the colour of an old hare's back, and then squench it, and you will have a tool fit for anything." And I believe my readers will find, if they follow his receipt, that he was right.

Curved tracers are made in the same manner, except that, when the tool to be made is a large one, the end of it is beaten into a groove to produce the curve; if it is small, the curvature is made with a small round file.

Ball tools are first forged, and then filed up; they are more accurate if the end is turned in the lathe. One of the American self-centreing chucks will hold them without any trouble. The cup tools are made from the ball tools after they are hardened and finished. The piece of steel from which the tool is to be made is roughly forged into shape, and rendered quite soft by being allowed to cool as slowly as possible after being heated to a red heat; it is then fixed in a vice, and indented with a ball tool of proper size; the outside is then finished with a file, or by grinding.

There is a class of tools, much used by silver chasers, which produce a matted or frosted appearance; these come principally from France, and are made by driving the end of the tool, while soft, with a tolerably heavy hammer, on to a file laid flat on the bench; the pattern produced will vary according to the kind of file used. Matting tools are generally made with a file; sometimes a small cold chisel is used; occasionally they are made with a graver.

Border tools are made with a graver. This is essentially a die-sinker's business, and a process that it is not worth an amateur's while to attempt, as he will not want many of these tools, and it would take weeks of practice before he could make a decent one. The larger tools for beating up will have to be forged by a good smith; the amateur can then finish the ends, if he feels so disposed. All tools will have to be hardened and tempered in the way already described.

CHAPTER IV.

PREPARING THE WORK.

Choosing Brass—Rolled and Sheet Brass—Price of Brass—Flattening: A Difficult Process; Method Pursued in—Tinman's Rolls—Polishing—Transferring the Design: Pricking Holes; French Chalk and Whiting; White Wax; Red Chalk; Carbonic Transfer Paper; Spirits of Turpentine.

BRASS.

Choosing Brass.—I shall assume, in treating of the preparation of the work, that my readers will take the advice I have given them, and try their "'prentice hands" on brass. Some ordinary rolled brass must, therefore, be procured. It can be obtained of almost any width—at all events, any width that an amateur is likely to want; 12in., 9in., and 6in. are useful sizes. The price increases after 12in. I have noticed that amateurs seem, as a rule, to go in for size rather than quality of work, which I think is a great mistake; a moderate-sized article, really well done, is far preferable to one of large size indifferently executed, besides being more useful, and better as a decoration. The most economical way is to purchase a roll of brass the width required, and of any length that is likely to be used. I generally buy mine in 6ft. lengths, and cut it up as I want it; this plan saves a good deal

of waste. Sheet brass differs in quality. That selected should be homogeneous, uniform in colour, and without any loose scales or flaws on the surface. I have had some marked with spots and streaks of a red colour, apparently caused by the metal having been overheated, or imperfectly mixed. As this entails much additional labour in polishing, all such metal should, if possible, be avoided. Anything like scales or loose pieces are fatal to good work, as no amount of polishing will get rid of them.

Sheet brass can be had of any thickness, but about 10 M.G. is what I generally use; if much thicker, the beating up is laborious, and the effect, when the work is finished, is not so good. Thicker metal is also more liable to spring off the pitch while being worked.

Flattening.—The brass having been cut square by the aid of the snips and the glazier's square, will now have to be flattened; this is done by laying it on the anvil and striking it with the mallet. Flattening requires practice and judgment, and should be done cautiously, or the plate will be made worse instead of better by the process. It is impossible to do more than give general directions as to the mode of procedure. One thing my readers must note specially, is that the plate must be moved to and fro with the left hand as the work requires, the right arm being kept perfectly steady, and the mallet always falling on the same spot on the anvil. This is more difficult to do than it would seem to be at first sight, as the right hand has a strong tendency to follow the movements of the left; and, if it be allowed to do so, the mallet will strike the plate on the edge of the anvil, and inevitably spoil the work. In a general way, it is a tolerable safe proceeding to commence at the centre, and give a series of light blows from there to each corner in succession; this will frequently do all that is required. Should any inequalities remain, they must

be reduced to a level by cautious blows around them. The raised part being slack, and the surrounding parts tight, it follows that, the blows being directed to the latter parts, they will be expanded, and the bulges will come down by degrees to a level.

As a rule, it is easier to reduce a thick plate to a true plane than a thin one; the latter is so readily influenced by the blows applied to it, that, unless great caution be used, it is difficult to bring it even approximately to a level.

If my readers wish for any further information on this subject, I would refer them to the first volume of Holtzappfel's "Turning and Mechanical Manipulation," where they will find, at p. 414, a thoroughly exhaustive, as well as highly practical and instructive, article on flattening thin plates with the hammer.

Even when plates are flattened by a skilled workman they are apt, when polished, to show the marks of the mallet. The best way, therefore, to prepare your plate for chasing, is to get a tinman to run it through his rolls for you; these rolls are too cumbersome and expensive to form part of an amateur's stock-in-trade, so that a minute description of them is unnecessary here, and I shall content myself with saying that they consist of three iron rolls, two of which are adjustable, and can be so arranged as to curl up a plate of metal until it assumes a circular form; the plate is then reversed, and curled up the opposite way, which effectually removes all bulges. The outside roller is now lowered until it is but slightly above the level of the space between the other two. If the plate be then passed through the rolls, commencing with one corner, a perfectly level plane will be the result. Care should be taken that all burrs or rough edges left by the snips are removed before rolling, or the result will not be satisfactory. As every tinman possesses these rolls, and will roll plates for a mere trifle,

I should advise my readers to employ one, at all events at first, rather than run the risk attendant on flattening with the mallet. If good work is to be attempted, it is very desirable that the surface to be worked upon be true and level.

Polishing.—The next process is to roughly polish the plate. The usual mode of doing this is by "sanding," which method will be fully described under the head of Finishing. If my readers have not the proper appliances, they can get up the work fairly well by rubbing it the way of the grain with oil and flour emery, or rotten stone, applied with cloth or flannel wrapped round a small piece of flat wood, until all imperfections are removed, and the plate is of a uniform colour. A rub over with a clean cloth will leave the plate ready for the design.

Transferring the Design.—In the matter of design, the professional chaser trusts very greatly to his eye, and, like the engraver, hardly ever requires a carefully-drawn pattern. Not so the amateur. In his case, the design should be accurately drawn upon paper, shaded—which will be a great help when the work comes to be beaten up—and then transferred to the brass. There are several ways of doing the latter. Chasers generally lay the design on the anvil, and prick holes with the pick (Fig. 10)—used with the hammer—along the lines of the drawing; practice enables them to do this with very great rapidity. The design is then laid upon the metal, and dabbed over with French chalk in powder, or fine dry whiting, tied up in muslin. Though the result is sufficient for their purpose, I cannot recommend the plan to the amateur, the disadvantage being that the outline is so very readily effaced that, before it could be worked upon, it would be necessary to secure it by going over it with an etching needle, thus replacing the dots with continuous lines. Another, and a better plan, is to rub a piece of white wax lightly over the plate, and then warm

the latter over the stove, or before a fire; this will distribute the wax, and give a thin film all over the work; as soon as it is cool it is ready for the design.

The back of the paper on which the design is drawn must now be rubbed over with a stick of red chalk (to be obtained of any artists' colourman), taking care that all the lines of the drawing are covered. It should then be gently rubbed with a soft rag, and any superfluous chalk dusted off. The design is now to be placed in position on the work, and the lines carefully gone over with a H pencil. The eye end of a large needle, held by its middle in a crochet holder, makes a very good tracer, though a steel crochet hook, reversed, answers the purpose even better, provided, of course, that the end be smooth and round.

The plan I adopt is to adjust the design on the brass, and then, while it is held down by one edge, I slip a piece of blue carbonic transfer paper underneath, and proceed to trace as before described. This method answers admirably in my hands, and I can reproduce the most intricate design with ease and certainty. It is well to place a piece of cardboard under the hand while tracing, or the pressure of the fingers will cause marks on the plate, and confuse the design. Owing to the greasy nature of the carbonic paper, this method is tolerably permanent; at all events, quite sufficiently so for all practical purposes. It is better to begin the chasing at the left-hand lower corner of the plate, as then the fingers which rest on the brass will not have to pass over the outline until it has been chased, and there will be, therefore, less danger of its being erased. The drawing will have to be retained in position while it is being transferred by means of weights placed upon it; these can be moved from time to time as required, taking great care not to alter the position of the drawing on the brass, or the work will have to be cleaned, and the tracing commenced

de novo, as it is impossible to place the design, when once it has been moved, in exactly the same position that it occupied originally.

If the brass does not take the design readily, rub it over with a few drops of spirits of turpentine, applied with a piece of rag, and all difficulty will vanish.

If my readers do not mind the extra trouble, the outline on the brass can easily be made permanently secure by tracing it over with an etching needle. Amateurs, particularly those who cannot draw, will find this, at all events at first, the safest course, as, if the outline, as left by the carbonic paper, were effaced, they would find considerable difficulty in renewing it.

CHAPTER V.

WORKING ON WOOD AND LEAD.

WORKING ON WOOD: *Elaborate Tools not Required—Fastening the Work—The Outline—Cutting Lines—Patterns—Beating Down—Setting—Borders.* WORKING ON LEAD *Easier and More Satisfactory than Working on Wood.*

WORKING ON WOOD.

I WILL now endeavour to describe the various methods employed in executing Repoussé Work. The simplest, and the one requiring fewest appliances, is working on wood, the only tools absolutely necessary for this process being a hammer, a tracer, and a punch. Elaborate tools are not required, as, though first-class work cannot be produced, a good amount of rough effect can be arrived at if the worker is clever. Properly speaking, this is not Repoussé Work at all, as the raised effect of the pattern is not produced, as in real Repoussé Work, by beating up the design from the back, but by beating down the ground that surrounds it, and, consequently, those modulations of form which give such a charm to Repoussé Work are altogether absent here.

Some workers merely lay the brass on the wood block, and trust to keep it in its place by pressing on it with the wrist that holds the tool; but it is better to fasten the work down to the

block by screws, if the wood is sufficiently large to admit of it being done; and if it is not, a fretworker's cramp, screwed on to the edge of the block, will hold the brass down, and assist in keeping it steady.

The Outline.—This is the first thing to attempt. Take a moderate-sized straight tracer, say about $\frac{3}{16}$in. to $\frac{1}{4}$in. wide, and, holding it firmly in the left hand, with the corner only touching the brass, give it a few decided blows with the hammer; if held rightly, it will progress steadily along the outline, leaving a clear, continuous line behind it. If it jumps off sideways, it has either not been held down firmly enough, or too much of the face has been in contact with the plate; to obviate the latter, the front corner must be raised a little more. My readers must not be discouraged if their first efforts prove failures. To keep the tool steady on the work, and to produce a well-cut, even line, is certainly not easy until considerable practice has made it so; but it is the key note to the whole process, and should be carefully persevered with until lines running in any direction can be cut with ease. My readers must always remember that, whereas for general purposes the left hand is but little used, in chasing and Repoussé Work everything depends upon it, the right hand having nothing to do but to wield the hammer. It will take some time before the awkwardness consequent upon this state of things is overcome. To avoid repetition, I shall give fuller instructions for holding and using the tools when I come to speak of Working on Pitch.

I would recommend my readers, before commencing any regular design, to fasten a piece of brass, about 6in. or 8in. square. firmly on to the block, by means of four screws, and then to draw, with a soft pencil, lines of various forms; these should be repeatedly chased, until a thoroughly satisfactory result has been obtained. The easiest line for a beginner to cut is a gentle

curve, and a straight line, or a complete circle, the most difficult, the difficulty being increased when the lines are double. The amateur will require considerable practice before he will be able to cut perfectly two lines exactly parallel and $\frac{1}{8}$in. apart. Fig. 21 shows a few lines such as I should recommend a beginner to practise upon; the easiest are on the left, and they increase in difficulty as they proceed to the right.

Patterns.—Large, bold patterns, which depend for effect rather on the vigour of the design than on highly-wrought details, are the most suitable for this kind of work. An

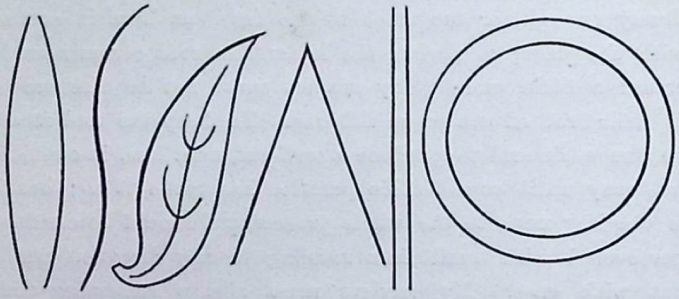


FIG. 21. CURVES.

arum lily with large leaves is an instance of what I mean, and forms a very suitable subject. Braiding patterns also come out very well, and are easily obtained; those that are specially made for transferring to cloth, by passing a heated iron over them, can be transferred to brass in exactly the same way, thus saving time and trouble.

Should the outline not be sufficiently bold after going over once, it may be gone over again with the tracer, of course taking care that the tool is kept exactly on the original track; the best effect, however, is produced when the lines are finished at the first attempt.

Beating down.—Having obtained a firm, clear outline, the next thing to be done is to beat down the ground all round the design; this may be done with an ordinary brad punch with a circular end, such as carpenters use to punch down nails with after they have been driven into wood. This tool will produce, when struck with the hammer, a series of dots, with which the whole of the surface, excepting the design, should be covered. Care should be taken to keep the dots as nearly equidistant as possible; at the same time, they should be placed irregularly, so as not to form any pattern amongst themselves, or it will detract from the effect of the design. It tends to keep the work in better form if the punch marks are thinly distributed at first, and the ground gone over again and again until sufficiently covered. The punching should commence between those parts of the design which are to appear raised, and be carried gradually towards them—in other words, you should work towards the outline, not from it; this has the effect of raising the part untouched by the punch.

Another method in use by some amateurs, is to go over the ground with a flat-faced tool, beating it down equally all over, and then using an ornamental tool, in the same way as I have described with the brad punch; rather better work can be produced in this way, but, on the other hand, it is more difficult.

Setting.—When the outline and grounding are finished, the plate will probably be found to be more or less bent out of shape. To restore it to a level, place it flat on the block, and then, holding the tracer perpendicularly on any part of the outline which is too high, give it one decided blow with the hammer. Repeat this process until the whole surface of the plate is brought to a level again. Some care, of course, should be exercised, as, if the blows are too strong, and the brass thin, the plate will be cut through, and the work spoilt, or, at all events, seriously damaged.

Borders.—A plain border, from ¼in. to ½in. wide, between two straight lines, helps to give a finish to this class of work; or a line of small circles, made with a cup tool, may be run round the edge. If a still better effect is desired, the plate may be reversed on the block, and each circle punched up from the back by a smart blow from a ball tool applied to the centre of it; this ball tool must correspond exactly in size with the cup tool used. The circles should just touch one another, but must not overlap, or the effect will be spoiled.

WORKING ON LEAD.

This process is somewhat easier, and more satisfactory, than working on wood. Lead being inelastic, there is less vibration, and, consequently, less noise. It is, also, altogether pleasanter to work upon than wood, and rather better class of work can be done on it; still, the general character of the designs should be much the same as those just recommended, as minute details cannot be effectively rendered. The method of working is exactly similar to that for working on wood, so I need give no further directions. The plate will become more or less out of level by the time the work is finished, and will have to be straightened in the manner already described. A few blows occasionally with the mallet, on the back of the plate, during the progress of the work, will tend to prevent its getting too much out of shape, and make it lie flatter on the block, and so easier to work upon. The mallet should only be used on the grounding, and the raised design should be carefully avoided, though it is not so easily beaten down as might be imagined.

CHAPTER VI.

WORKING ON PITCH.

Cement: Preparing; Recipes for; Method of Applying—Fixing Plate—Pitch Pan: Manipulating—Warming Pitch: Contrivances for—Chaser's Bowl—Cleaning—Chasing—Manner of Holding the Tools—Bad Habits Easily Acquired—False Strokes—Difficulty of Striking with the Hammer—The Best Tool to Begin with—Slight Curves the Easiest Lines to Cut—Feebleness of Outline—Curved Tracers—The Conventional Rose—Circles—Water—Shading—Feathers—Grotesque Head—Matting—Figured Punches—Inexactness of Tools—Even Grounding.

I HAVE thought it well to describe working on wood and lead before coming to pitch, on account of the former methods requiring fewer appliances, and giving less trouble in preparing; the results are, however, very inferior, and the process itself is very much more difficult than the one we are about to consider. A plate well secured to the block is a delightful material to work upon, and, as it has no tendency to slip about, or bend up, as is the case when worked on wood or lead, the lines may be cut with much greater precision, and work of the finest character produced. The noise, also, which is such an objectionable feature in the other methods, is almost absent here. I would, therefore, strongly recommend my readers to work entirely on

pitch. There is, I admit, a little more trouble attendant on this manner of working, but the comfort, and the improved results, amply compensate for it.

Cement.—The first thing to be done is to prepare the cement; this consists of about equal proportions by weight of Burgundy pitch and plaster of Paris. The pitch is first melted in the kettle, at as low a temperature as possible, and the plaster added by degrees, the mixture being stirred continually. If the weather is very cold, or the cement in use has been re-melted very frequently, I add a piece of Russian tallow about the size of a large walnut, though I have rarely found this to be necessary. It is desirable that there should be a certain amount of hardness as well as toughness about the cement, or it will not hold the work with sufficient firmness, and the plate will curl upwards as it is worked, dragging the pitch with it.

Another good recipe for cement is the following: Black pitch, 6oz.; brick dust, 8oz.; rosin, 1oz.; linseed oil, 1 tablespoonful; mix as in the last recipe. This cement is softer than the foregoing, and gives excellent results.

If a stone block be used, the pitch should be allowed to cool a little before use; it is difficult to keep it on the block if too fluid. Now place the block on the cushion, and level it; then take a ladleful of pitch, and pour it in the middle of the stone, spreading and arranging it with the back of the ladle. Add pitch from time to time, taking care that you have sufficient space covered to allow of a good margin round the work, and pausing to allow one ladleful to cool a little before another is added. The pitch should be about ¾in. in thickness.

Fixing Plate.—The plate may now be gently laid down upon the cement, beginning at one end, and lowering it gradually, so as to exclude air bubbles. The plate should be roughly polished, and have the design transferred to it before it is

laid down on the pitch. When the pitch has assumed the consistency of putty, it should be pushed up to and over the edge of the plate, until the face of the work is covered to the width of about ⅛in. to ¼in. all round; this will form a sort of frame, and tend greatly to prevent the plate coming away from the pitch. The spatula (Fig. 19) will be found most useful here; if it is dipped occasionally in cold water, the pitch will not adhere to it. Chasers use their fingers only in arranging the pitch; but as it is very difficult to free the fingers from it, when once it has got on them, the spatula will be found much the best thing for the amateur to use. The work may now be laid aside to cool. The plate should not be chased while it is warm, or there will not be resistance enough in the pitch to keep the metal in shape.

Pitch Pan.—The pitch pan (Fig. 2) requires rather different manipulation. The first time it is used, the pitch must be melted in the way I have already described, and ladled out into the pan until it is filled to within ⅛in. of the top; when required for use, it must be re-heated, and the work laid down on it exactly as on stone. In the case of the stone block, the pitch has to be *removed* after each operation, and *re-melted*; this need not be done with the pitch pan. If an oven is at hand, all that is necessary is to place the pan in it until the cement assumes the right consistency, and looks and feels like black putty; it is better that it should not be completely fluid. If an oven is not available, the surface of the pitch may be melted by means of a gas jet, brought down to the pan by attaching an indiarubber tube to an ordinary gas bracket. When the pitch is of a soft nature, all that is required is to warm the brass sufficiently, and lay it at once on the pan; if it is pressed down equally all over, and weighted until it is cold, it will attach itself firmly to the cement. Mr. Gawthorp has a clever little contrivance for

warming the surface of the pitch, which I can recommend to my readers for its simplicity and efficiency. If the work be laid aside for a time, or the weather be very cold, it is well to put the pan down before a fire to warm, so as to toughen the cement, and render it less brittle, or the plate is apt to become loose; if this should occur, there is nothing for it but to take it up, re-melt the pitch, and commence again.

Chaser's Bowl.—The bowl is used just the same as the pan for ordinary articles. When hollow work is wrought upon it, such as cups, teapots, &c., the work is filled with pitch, which is allowed to set until it is sufficiently stiff not to pour out easily; it is then capsized upon the bowl, which has already been filled with pitch. The bowl can be made available for work of larger diameter than itself by the aid of an iron band, about 4in. deep, and of sufficient diameter to inclose with ease the article to be chased. It must be secured from opening by twine passed round it and tied. Place a layer of sand (which should be damped) inside the iron band, and put the work upon it, face downwards; now pour pitch upon this until the iron band will hold no more. The bowl should also be filled with pitch, and, when the cement is nearly cold, but still tough, must be reversed—that is, placed mouth downwards on the pitch in the iron band; as soon as it is cool, the band may be removed, the work turned over, and the chasing proceeded with. The only use of the sand is to prevent the hot pitch from sticking to the under surface.

Cleaning.—When the work is finished, it should be raised from the block, or pan, by chipping off the cement that lies on it; if a chisel be now inserted under one corner, the work will spring off without much trouble. More or less of the pitch is sure to adhere to the work, but this can be got rid of by heating it over the stove, or a spirit lamp, until the pitch softens, and then wiping it off with cotton waste; a few drops of petro-

leum will greatly assist the operation. If the pitch still adheres to the outline and grounding, warm the plate again, and, after sprinkling it with petroleum, rub well with a stiff brush, and wipe off with cotton waste—an old toothbrush is what I generally use for the purpose. Cotton waste is a most useful material, and the amateur mechanic should always keep a stock of it. It is the waste of the spinning mills, and can be procured of almost all ironmongers. The work is now ready for polishing and lacquering.

Chasing.—The first thing the learner has to acquire is the proper manner of holding the tools. Bad habits are easily acquired, but are difficult to eradicate, so that it is much better to begin right at once. The tools should be held with the first and second fingers and the thumb of the left hand, the tip of the second finger resting on the nail of the third; this finger and the little one should be firmly placed on the plate, thus steadying the whole hand (Fig. 22). The third finger has most important duties to perform, inasmuch as it forms a sort of pivot, on which the fingers holding the tool turn; the little finger must be kept close up to the third finger, and will aid materially in keeping the tool steady. The tool must be grasped firmly, and held down with some little force on the brass, to counteract any tendency it may have to jump aside when struck with the hammer. It must be remembered that false strokes cannot be erased, so due care must be exercised, so as to avoid making them. As the pen is always used from left to right, the beginner has a natural tendency to cut all his lines in that direction. I should recommend that this habit be not encouraged, but that, from the commencement, lines be cut in all directions; this will become very easy after a little practice, and will tend greatly to facilitate the work. Unlike most other work, in chasing the right hand plays quite a subordinate part, its duty simply being to wield the hammer,

which should be held lightly by the bulb at the end of the handle, with the forefinger stretched along the handle which tends to give precision to the blows. When a blow is struck, the centre of the hammer should fall on the end of the tool; if this matter be not attended to, the tool is apt to spring on one side, and mar the work. At first this will be found rather difficult, as the position of the tool is constantly

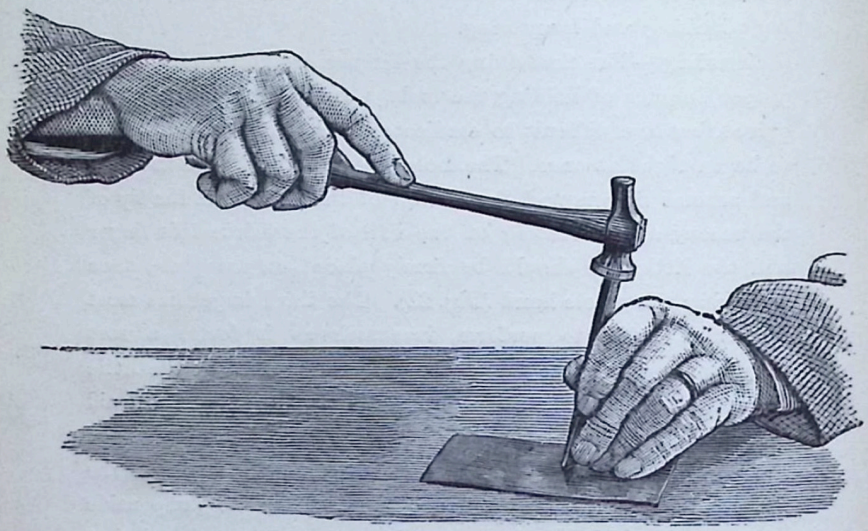
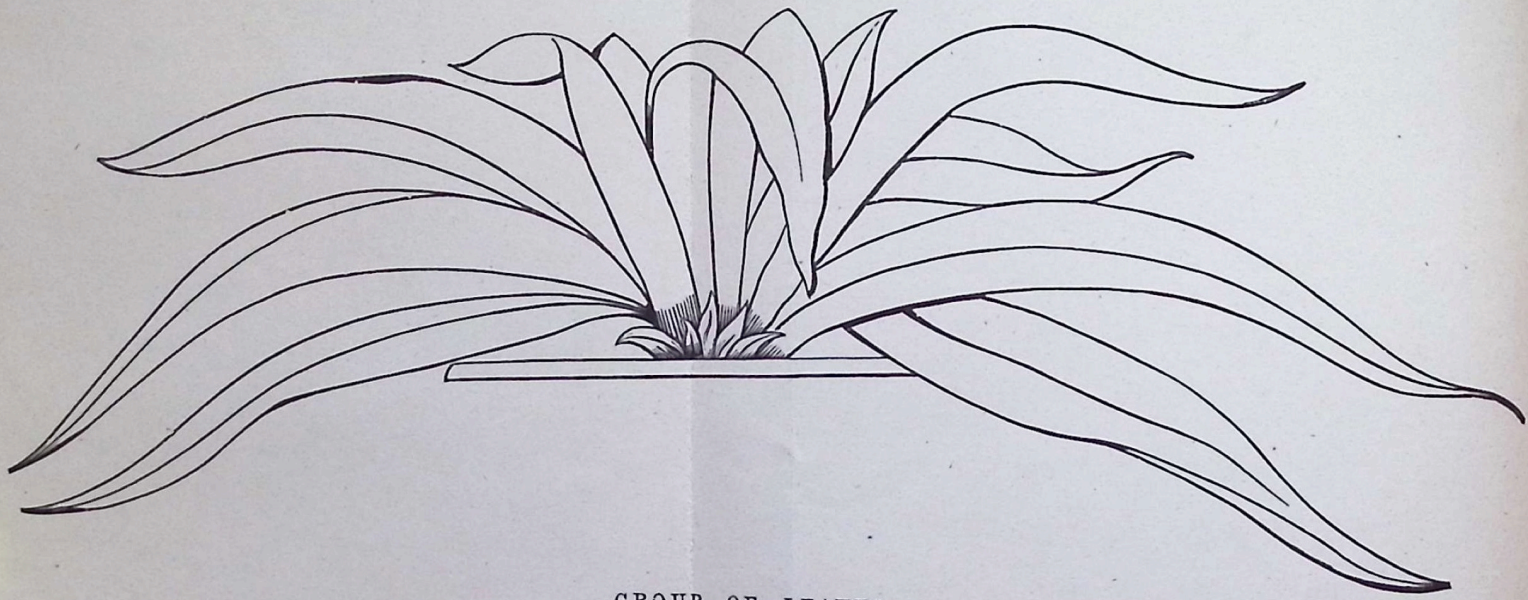


FIG. 22. MANNER OF HOLDING TOOLS WHEN CHASING.

varying, but after some practice the two hands will work together without an effort, and the hammer will readily follow the tool, no matter which way it is turned. If the right elbow be raised until the arm be horizontal, or nearly so (as shown in Fig. 22), it will be found much easier to strike the tool fairly on the head. When working on pitch, the blows need not be nearly as heavy as when working on wood or lead. A rapid tap, tap, tap, makes better work than more decided



GROUP OF LEAVES.

blows with a longer interval between. In many cases, the weight of the hammer alone is quite sufficient to cut a suitable line. A straight tracer is the best tool to begin with. As I have before said, a slight curve is the easiest line to cut. The outline should be bold, clear, and decided. The beginner will succeed best if at first he makes it of one uniform thickness, retouching it if necessary, though this should not be resorted to if it can be avoided. As soon as a good line can be cut an effort should be made to put some expression into it. The line should be made thicker in some parts than others, deep, telling touches, being put in at the junction of lines, and other places, thus forming shadows, which tend to throw up the design, and give vigour and effect to it; in fact, the tool should be used just like an artist's pencil. It is here that those who are able to draw will greatly excel. Beginners have a strong tendency to feebleness of outline, and I would especially warn them against it. Nothing looks more flat and uninteresting than a weak outline, without lights and shades. The Plate shows a group of leaves which may serve for practice, as they illustrate what I mean. Tracers vary not only in width, but also in thickness; the sharper ones are used for putting in the fibres of leaves, markings on feathers, &c., and the blunter ones for the broader outlines just alluded to.

Curved tracers are very useful for some work, but in general a straight tracer is used for the outline, even when the curves are very sharp. The conventional rose (Fig. 23) is an instance where, with the exception of the centre, a straight tracer may be used for the whole outline. In going round the inner curves, which are very sharp, the tool must be much raised, so that the extreme corner only touches the brass; and the top of the tool must be inclined outwards—that is, from the centre of the curve. In cutting a complete circle, a curved tracer of the same sweep is somewhat easier to use, unless the circle is sufficiently

small to be knocked in at one blow with a cup tool. I would here call my readers' attention to the motto at the commencement of this work, as it is only by steady, careful practice, that success can be obtained. It is much better to cut the same pattern over and over again, until it has become quite familiar, and can be cut correctly and well, even though the process be a little irksome, than to go from one thing to another in a hasty and perfunctory manner.

Water.—I will now give a few hints on representing particular objects, which can only be indicated, and not shown by

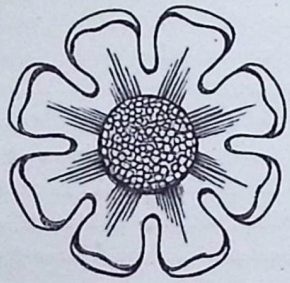


FIG. 23. CONVENTIONAL ROSE.

a definite outline. Water is one of these. In some subjects curved lines only are used to express it, as in Fig. 24. The effect of it may also be very well given by using a straight and rather sharper tool than usual, and without any curve on the edge. This tool should be held quite upright, and about $\frac{1}{8}$in. above the brass; if it be struck with the hammer, it will cut a fine line, and, the fingers acting as springs, will rebound into its original position. The hand being at the same time moved in a zigzag direction, the result will be as shown in Fig. 25, and will give as good a representation of water as can be arrived at under the circumstances. Shading may also be done after

the same manner, using a straight or curved tool, as occasion may require. In flat chasing, as much shading may be used as is considered desirable, though it is better not to have too much in Repoussé Work, as the beating itself gives the necessary effect, and the light falling on the bright lines of the shading interferes with the general appearance.

Feathers are difficult to delineate, and should merely be indicated by a few slight strokes, which may be done in the manner I have just been describing, care being taken that the result be not stiff and hard. Of course, a vast variety of sub-

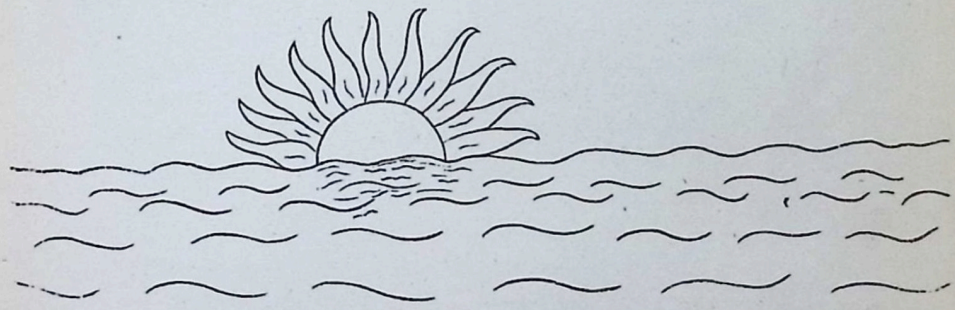


FIG. 24. WATER.

jects may have to be worked, to give directions for all of which will be impossible; but the foregoing illustrations will give some idea how they may be treated.

Fig. 26 shows a grotesque head, which forms part of a rather elaborate scroll, and will serve to show the class of work which an advanced pupil may aspire to.

Matting merely consists in covering the spaces between the design with markings. These may be arranged so as to touch one another, forming a close mat, or placed a little distance apart, as an open mat, so as to form a grounding to the

picture. The simplest form of matting is made by dots, and for this the pick is used; if carefully done, it looks well, and for some subjects is very suitable. A variation may be made in this kind of matting by arranging the dots so that they shall form a continuous line of looped figures winding about in every direction; this looks particularly well where the spaces to be covered are large. Where the work is small, figured punches are generally preferred; the variety of these is endless. I do not give an illustration of them, as it would

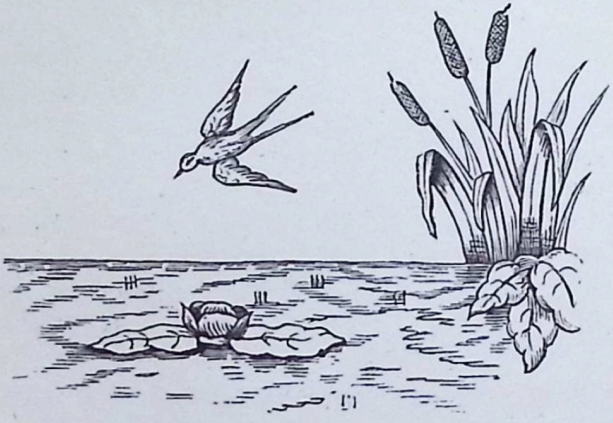


FIG. 25. WATER.

be impossible to render by engraving the peculiar effect they produce on the brass; so I leave my readers in the dealers' hands, to select for themselves. To produce an even grounding is not at all easy, and, as the effect of the work greatly depends upon it, I must impress upon my readers the importance of using due care in this part of their work. As the tools (with the exception of circular ones) are never mathematically exact, it will tend greatly to the success of the work if one side of the tool be marked with a file, and

this side always kept under the thumb. In matting, the tool should be held quite upright, and the face of it flat on the metal; it must also be held firmly, or it will spring off, and give a blurred impression. It is better to go round the outline first, and work from there to the centre, so as to avoid having partial impressions where they would show the most.

FIG. 26. GROTESQUE HEAD.

The plate may now be taken off the pitch, and cleaned as I have already described; if the pitch be cold, it will come off readily enough. If the work is intended for flat chasing only, it is now, with the exception of polishing and lacquering, finished; though, of course, if it be at all distorted, it must be flattened, the same as if worked on wood or lead.

CHAPTER VII.

REPOUSSÉ WORK.

Raised Work—Beating—An Easy Pattern—The Pear—Plaste Casts—Working on the Reverse Side—Tool Marks—Scrolls—Cracking of Brass—Annealing—Setting—Flattening: A Good Method for—Hollow Work—The Snarling Iron: How to Use—Flutes—Pierced Work—Watch Cocks.

Raised Work.—If the design has to be raised, it will have to be laid, face downwards, on the block or pan, in exactly the same way as it was for chasing. The beating tools already described and illustrated (Figs. 13, 14, 15) must now be had recourse to.

We have now come to what is decidedly the most difficult part of the process, and which will require a good deal of practice and experience before good work can be executed. The principal difficulty lies in the fact that the workman cannot see the effect of his blows on the face of the plate, and that the result will be reversed, the parts beaten down appearing raised, and those left unbeaten depressed. The beating should be commenced as soon as the pitch is sufficiently set to bear the blows, the brass still being warm. Take the largest-sized beating tool that you will have to use, and roughly beat down the principal parts of the design, not

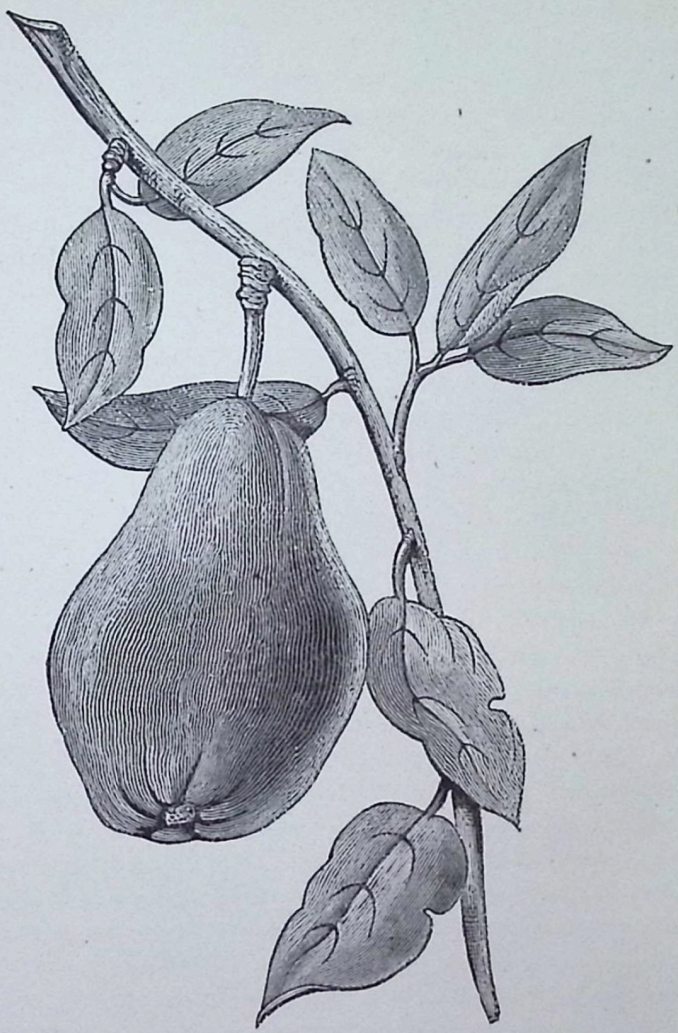


FIG. 27. PEAR.

going in any case to the full depth that will be ultimately required; then, with a smaller tool, go over the lesser parts in the same way, and you will have your work roughed out. It must now be carefully worked over again, smoothing out the marks left by the first beating, and deepening any part that requires it. The outline must also be carefully attended to, and the adjacent parts brought to their full depth. My readers must use due caution in their first attempt, and consider well what they are about to do before they do it, for, as in chasing, mistakes cannot afterwards be rectified.

A comparatively easy pattern, such as the pear (Fig. 27), should be chosen for a first essay. On examining the back of the plate, the outline, if it has been properly cut, will appear distinctly; this, as far as possible, should be preserved, as, if it is once beaten out, there is nothing left to guide the workman, and mistakes, which cannot be remedied afterwards, are sure to occur. Most difficulty will be found, in this respect, where the same part of the design is raised to different heights; for instance, a raised pattern on a vase. In such a case, it is better to beat up the pattern first, so as to secure the outline, and then work up the vase afterwards; if the pattern is knocked out, it can be raised from time to time as required. In the case of the pear, the repoussé tool (Fig. 13) should first be used on the lower part of the fruit, and, when that is tolerably raised, on the part next to the stalk; the middle of the pear should not be so high as either of the other parts. The tool should first be used on the centre, working off gradually towards the sides. In all cases it is better to work from the deepest to the shallowest parts. When the work is sufficiently raised, the protuberances round the eye and stalk should be worked up, taking care that they die away gradually into the body of the fruit. The leaves should now be beaten; the tool shown in Fig. 15 will be suitable for these. Take care that the work does

not become tame and uninteresting, but endeavour to put some life and "go" into it, by raising one part higher than the other. In all probability it will become necessary for the beginner to take up the plate before the process is finished, and examine his progress, though in time experience will enable him to dispense with this. It is a great help if the design from which he is working be shaded; or, still better, if he can procure a plate already beaten to work from. Plaster casts of good work may now be readily obtained, and these will be of great assistance to a beginner. As I have before recommended, in chasing the design should be worked again and again until all faults are eliminated, and the result is quite satisfactory; much more rapid progress will be made by adopting this course than would be the case if fresh subjects were always taken up. My readers will see at once that the effect and value of the work depends upon the nice gradations of relief, and, therefore, that too much care cannot be taken in this part of the work. In working, the tools should be held in different positions, sometimes inclined and sometimes vertical, as either the edge or the centre will best effect the purpose required. It is quite impossible to do more than give very general directions on this head, and for further details I must hand my readers over to that best of masters—Experience.

Some works of large size, and in high relief, are occasionally commenced on the reverse side, and the most prominent parts beaten up, the artist finishing the face side afterwards; but the process I have described is much the most usual one. If the directions already given are carefully and well carried out, a very good result may be arrived at; but if really first-class work be intended, the plate should be laid down again on the pitch, face upwards. Special care must be taken, when doing this, to fill all the hollows in the back of the plate with cement before it is laid on the block or pan, so that it may be quite

solid. Now, with suitable tools, carefully work over the whole of the raised part, beating down any portion that stands up too high, and sharpening the outlines where necessary. The ground round the design should also be beaten down with a flat tool; this in itself will give great vigour and beauty to the work. This process is, in fact, modelling in metal, and gives scope for any amount of skill and taste. It is advisable, when work has to be finished on the face, to run a line with a blunt tracer just inside the original outline, where it shows through on the back. This gives wonderful sharpness to the figure, particularly if a blunt tracer be run over the outline on the

FIG. 28. SCROLLS.

face afterwards. As the plate is face upwards, it is easier to see what parts require beating down, and the effect of the work put upon it; but, notwithstanding this, the process is a very difficult one, and should not be attempted until the ordinary method of beating up from the back has been thoroughly mastered. After the modelling of the design is completed, those parts that require special markings to show the texture, such as hair, drapery, scales, feathers, &c., should be worked over with suitable tools; the markings on leaves and stems of trees may also be put in. Last of all, the ground should be finished with matting or other tools, and then the work will be ready for lacquering.

No attempt should be made to obliterate the tool marks left on the face of the plate, either by rubbing or burnishing them out; on the contrary, they should be so made in the direction of the texture as to give the idea of form, and light and shade, and help the effect generally. As it is hardly possible for this process to be effectively executed by anyone who has not seen it done, I would strongly recommend my readers to take lessons before attempting it. The scrolls shown in Figs. 28 and 29 are examples of work requiring this treatment, as they cannot be finished perfectly from the back only.

If the work is in high relief, the constant beating may harden the brass so much that there is a danger of its cracking. To

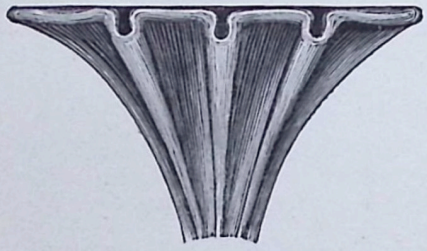


FIG. 29. SCROLLS.

avoid this, annealing is required; this is done by heating the work on the stove until it becomes nearly red hot, and then allowing it to cool gradually. For brass worked up to moderate heights this is not usually necessary, but in the case of silver has very commonly to be done. Of gold I have little or no experience, but I believe it also requires frequent annealing.

The plate will now, after cleaning with cotton waste and petroleum, want "setting," particularly in those parts where the beating has been carried beyond the outline; due care should be exercised in doing this, or the marks of the tool

will be visible, and interfere with the effect. The work is now ready for finishing.

A very good way of flattening the plate after it is beaten up, and which I have lately adopted, is the following: On a board 18in. by 14in., and 1in. thick, nail some thick felt. Lay the plate to be flattened, face downwards, on this, and, with a raw hide mallet, go gently over the parts that are out of level. The mallet should be of some considerable size, say 2½in. across the face. With a little care the work may, by this means, be made beautifully level without in any way damaging the design.

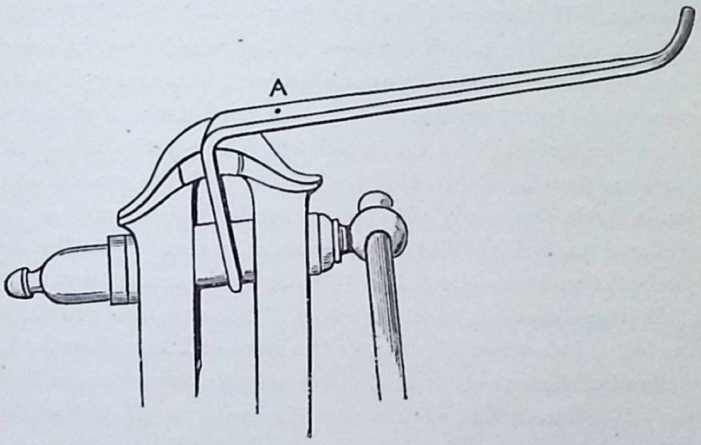


FIG. 30. SNARLING IRON.

Hollow Work.—I have already described the method of laying this down on the pitch, and there is, therefore, no need to recapitulate it. The bowl is almost invariably used for this purpose. The chasing is proceeded with in exactly the same way as with flat plates, but there is a marked difference in the manner of beating up. It being impossible to use the ordinary tools inside, say a teapot, a special tool, called a **Snarling Iron**, has to be requisitioned. Fig. 30 gives

the appearance of it when fixed in a vice. It is made from a piece of iron 1in. wide, ¼in. thick, and 14in. long, exclusive of the part turned down at right angles, and which is held in the vice; the other end is bent upwards, and formed into a knob. These tools vary in size for different classes of work; some of them are made with shifting heads. As they are so easily made, and, consequently, very cheap, it is better to have two or three of the most useful sizes. The largest one need not be above ½in. in diameter across the head. To use the snarling iron, it is firmly fixed in the jaws of a vice. If the work is small—say a cup—it is held firmly with the left hand, with the part to be raised exactly over the head of the snarling iron; a blow with a hammer is then given at the point marked A. The rebound of the iron gives a blow on the inside of the vessel, which raises the metal in the same form as the end of the tool. In large works, one person holds the work with both hands, while another is employed to strike. Flutes, so commonly seen on the lower portion of vases, are formed in this way; they are set out first of all, with compasses, on the surface of the vase, and are then snarled up by a series of blows in the manner I have described, the head of the iron being made of a suitable shape to suit the size of the flutes. The work is now filled with pitch, and, while it lies on the cushion, the flutes are finished with chasing tools, some of these forming counterparts with the flutes to be worked. During this process lead is sometimes used for filling the article—if made of copper or brass—which is melted out when the work is finished. The ordinary chasing hammer is too light to be used with the snarling tool, and a much heavier one—its weight depending on the size of the work—will be necessary.

Pierced Work.—It often adds greatly to the beauty of certain articles if portions of the ground are removed; this is effected by means of a piercing saw (Fig. 31). Many of my

readers are doubtless acquainted with fretwork; to such of them as are it will be sufficient to say that piercing is merely fretwork applied to metal, and is done mainly in the same way, the principal differences being that the saw frame is smaller than that used for wood, and the saw itself narrower, and finer in the teeth. A hole is drilled in the piece to be removed, generally at one corner, and the saw, after being unclamped at one end of the frame, is passed through the hole, and fastened again. The saw is now worked carefully along the outline until the piece required to be removed is cut out. Care must be taken to

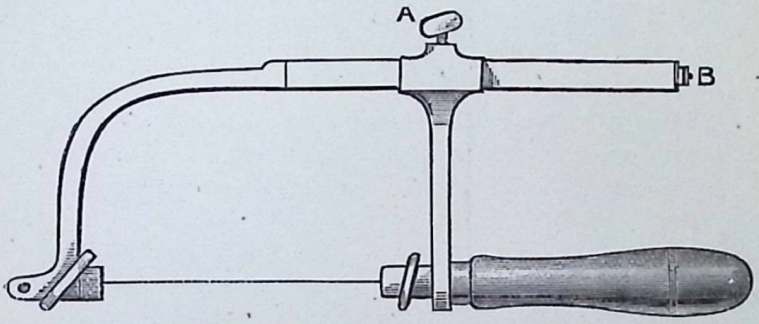


FIG. 31. PIERCING SAW.

keep the saw always vertical, or it will break. The saw may be brought to a proper tension by loosening the screw A, and pressing on the end B; when it is sufficiently tight, the screw A must be firmly screwed down again.

Too much pressure should not be put upon the saw, and a fine one should be used. If, as is most likely to be the case, the sawn edges are at first uneven, they must be filed smooth with a fine file; what are called "needle files," and which can be obtained, of all shapes, of any tool maker, are very suitable for the purpose. With a little practice piercing can

be done very rapidly. The saw will be found to work better when the strokes are given tolerably quick.

It greatly facilitates the use of the saw if the work be

FIG. 32. PIERCED FINGER PLATE.

laid on a piece of wood shaped somewhat like a bootjack and screwed firmly down to the bench. The work may also be done very rapidly with a fret-cutting machine, provided that

it be one of those in which the saw rises and falls vertically. I have cut brass nearly ¼in. thick with one of these machines.

Fig. 32 gives an example of pierced work intended for a finger-plate; this, as well as all other such work, should be chased and beaten before being pierced. The watch cocks from old verge watches, now so much used for jewellery, are exquisite specimens of old English pierced work, an immense amount of skill and labour having been brought to bear on many of them. The drawing is beautifully free and artistic, and the piercing is wonderful; in many that I have seen, the thickness of metal left between two saw cuts did not exceed the width of a hair, and, at the same time, the sides were perfectly even and smooth. My readers will get many hints by carefully examining some of these.

CHAPTER VIII.

FINISHING.

Definition of—The Polishing Head—The American Polishing Head—Spindles—Sanding—Trent Sand—The "Bob"—Liming—Silver—Polishers' Lime—The "Buff"—"Glossing up"—The "Dolly"—Dipping—Dipping Aquafortis—Method of Dipping—Drying the Work—Bronzing—A Curious Effect—Recipes for Bronzing Liquids — Lacquering: A Necessary Process; Method of—Removing Lacquer—Recipe for Lacquer—Benares Brasswork—Colouring Silver—The Scratch Brush: How to Make; How to Use—An Excellent Plan of Finishing Brass—Freeing the Work from Grease—Parcel Gilding.

By "finishing" is meant polishing and lacquering. There are several methods by which a good polish, or, as it is termed, "colour," can be given to brass. By professionals it is done with what is termed a "polishing head"; this is shown in Fig. 33. It consists of a steel spindle, mounted very much after the manner of a lathe head, and driven either by steam or by a wheel and treadle. It differs, however, from a lathe, inasmuch as both ends of the spindle can be made available. One end consists of a long taper screw only; and the other, besides the screw, has a flange and nut, with which are held the various wheels employed. The Americans make a very nice light pattern, very suitable for an amateur's use; these

can be obtained from Messrs. Churchill & Co., Finsbury. Amateurs having a lathe may easily contrive to fasten one of these heads on it by fitting some wood in the opening of the bed, and screwing the head on to it, and so drive it with their wheel and treadle. They will find it very handy for grinding small articles, as well as for polishing, by fitting emery wheels, or a small grindstone, on the end having the flange and nut; or, if it is preferred, the polishing head may be dispensed with by using a spindle, such as is em-

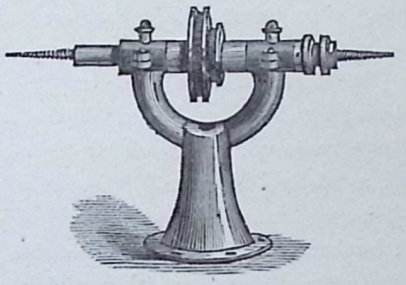


FIG. 33. POLISHING HEAD.

ployed for carrying small circular saws, between the heads of the lathe. These spindles can be obtained from any tool-maker. If the lathe is a valuable one, this plan is not to be commended, as the dust which is inevitable in the processes of grinding and polishing is apt, notwithstanding every precaution, to get into the working parts of the lathe, and quickly wear them away.

Sanding.—This is the first step in getting a good polish on the work. The material employed is Trent sand which has been already used by glass-cutters, and the greatest part of the cut, consequently, taken out of it; it must be carefully sifted before use. A "bob," or wooden disk covered with buff

leather, having been fitted on the spindle, a handful of sand is laid on the work, which is passed to-and-fro under the bob while it is in rapid motion; this quickly removes all imperfections on the surface of the brass, and renders it smooth, and of an even colour. It is now brushed, to remove any sand that may attach to it, and is ready for chasing; after this and the beating up are completed it must be limed.

Liming.—Sheffield lime is generally preferred for this purpose, and is called "silver-polisher's lime." It is used in an unslacked state, being merely finely powdered and sifted. A "buff," which is a disk made of walrus, or seahorse, hide, is employed for the lime; this is used at first with a little lard oil or Russian tallow, and, when all the markings made by the sand are removed, the work is "glossed up" with dry lime and a "dolly," or mop. This mop is made of a number of disks of coarse calico, joined together by two pieces of sole leather, placed one on each side of them; the whole thing is fastened together either with screws or rivets, or by sewing with leather thongs. A small hole is made through the centre, to fit the taper screw of the polishing head. Polishing can be done very perfectly, and with great rapidity, by this method, but it requires a good deal of power, and is a very dirty process. All the polishing materials must be kept carefully separate, and each wheel used only for its own purpose. When the brass accumulates on the bob, or buff, it can be removed with a common chisel, used as a turning tool. A circular brush is a useful addition, particularly for chased work. A thick paste of whiting and water, spread thinly over the plate, and brushed off with the circular brush, gives a good polish, especially if the plate be glossed up afterwards with a dry "dolly."

Dipping is very much resorted to in getting up brass-work, particularly if it be cast, such as chandeliers, &c. The brass has first to be cleaned with a brush, used with sand and water. A bath large enough to contain the articles to be dipped is filled with "dipping aquafortis"; the ordinary aquafortis of commerce will not answer. At least two other vessels filled with water must be placed close to the dipping bath. The article to be dipped, suspended from a piece of copper wire, is plunged into the aquafortis; the moment the surface becomes covered with minute bubbles the article must be removed and well washed in the first water; should the colour not be satisfactory, it must be dipped again, then well washed in both waters, and afterwards under a tap, until every trace of acid is removed. The period of immersion in the dipping bath should not exceed one or two seconds, or the brass will turn black, and have to be scoured again with sand and water. To dry the work, use sawdust, applied with the hand. Brass after dipping is of a fine gold colour, with a dead surface; if this is objected to, the work must be polished as I have described, or burnished with a steel burnisher, moistened with stale beer.

For those amateurs who have not the means of finishing their work in the regular manner, the simplest method I know of is to roll up a piece of cloth, 3in. wide, very tightly, and secure it by serving it over with twine; moisten the end with oil and fine rotten stone, and well rub the plate the way of the grain. When all scratches and imperfections are removed, clean the plate with cotton waste and petroleum. A very fair surface can be produced by these means alone. If a more brilliant polish is desired, it can be obtained by using a pomatum made for the purpose by Messrs. Vogt & Co., Berlin; many ironmongers keep it; the genuine has a spiked helmet as a trade mark. The amateur may, if he pleases, altogether

relieve himself of the dirty and uninteresting work of polishing by purchasing his brass already prepared from Mr. Gawthorp, who will also finish the work when completed, if required. I strongly recommend this course, at all events to ladies.

Bronzing.—This gives a dark, antique look to the brass, which is very suitable for some subjects. There are a great variety of recipes for the purpose; the simplest, and, on the whole, the best, though the most expensive, is a solution of platinum bichloride in rain water. This is applied to the work with a brush, or the brass is immersed in it until a sufficient effect is produced; it is then washed in water, dried in sawdust, and lacquered; a fine black colour is the result. The best class of mathematical and optical instruments are bronzed in this way. A very curious effect may be produced by dipping a piece of clean brass into the platinum solution, and immediately removing it. If it is now left undisturbed, various colours, ranging from pale yellow to deep blue, will appear on the surface; if cleverly done, the result will exactly resemble the old-fashioned blued gun locks. As soon as the desired appearance is arrived at, the work should be washed, and dried in sawdust. To the best of my knowledge, this method of colouring metal has never appeared in print. Another good recipe for bronzing is: Sulphate of iron, 2oz.; white arsenic, 1oz.; spirits of salts, 20 fluid oz.; mix, and apply as before. Bobs, mops, brushes both straight and circular, as well as all other implements for polishing, can be obtained of Messrs. Hopwood & Co., 103, Great Hampton Street, Birmingham.

Lacquering.—All metals when exposed to the air, no matter how well polished, will tarnish or become oxydised unless protected in some way; to avoid this, brass is always lacquered, or coated with a thin film of hard, transparent varnish, which is dried by heat. In theory this appears simple enough, but in

practice it is one of the most difficult things I know of to accomplish. It may be done readily enough after a fashion; but to lacquer, say an 18in. tray, so that the lacquer shall be quite invisible, and the polish not at all interfered with, puzzles all the amateurs I ever met with, and, for the matter of that, many professionals also. It is better, at all events at first, to purchase the lacquer, which can be had of different colours—pale, medium, and dark gold, amber, &c.; medium gold is as useful as any. Nothing can answer better for heating the work than the stove I have already described (p. 16), if a piece of sheet iron, about 15in. or 16in. square, be laid over it. Place the work, after careful polishing and dusting, on this plate, until it is just as warm as the hand can bear, and then remove it. Then, having previously dipped a broad camel hair brush in the lacquer, give it one sweep across the work, and continue these strokes until the whole surface is covered, and on no account go twice over a place. All working of the brush backwards and forwards as in painting must be studiously avoided. Too much lacquer should not be taken on the brush at one time, and the whole manipulation should be conducted as quickly as possible. The work must now be returned to the stove, and should remain there until the solvent of the gums is evaporated, and a perfectly clear, transparent film, which the eye cannot detect, results. My readers should remember that, provided every part be covered, the thinner the coat the better. Should, however, the work require it, another coat may be given after the first has become hard. Too much heat must not be applied, or the work will turn a dark colour, and be spoiled. All draughts must be carefully excluded, and dust prevented from settling on the work. It is better to err on the side of heating the brass too little rather than too much, before the lacquer is laid on. If the lacquer bubbles or smokes, the work is too hot.

During the process of lacquering the articles must not be held in the fingers, or marks will remain which cannot be removed afterwards. If the operation does not prove successful, there is nothing for it but re-lacquering; this means removing the lacquer by boiling the work in caustic soda or potash, made by adding quicklime to a strong solution of the alkalis. A strong solution of washing soda will answer, but it requires a longer time to act. The lacquer having been got rid of, the article must be washed, dried in sawdust, and repolished, and another attempt made. As the caustic solution will act on the skin, the work must be held by pliers, or copper wire. By the processes I have mentioned above the original colour and beauty may be restored to old brasswork, no matter how much dirt and verdigris cover it.

The basis of lacquer is seedlac, dissolved in methylated spirit, in the proportion of 3oz. of the former, by weight, to 20oz., by measure, of the latter. This is coloured with annatto, dragon's blood, gamboge, saffron, turmeric, &c., according to the purpose for which it is required. I do not consider that it pays to make lacquer for oneself, as it may be bought very cheaply.

Benares brass work is apparently unlacquered, as the colour can always be renewed by rubbing it with a slice of lemon, washing, and drying with a soft cloth.

Silver may be made of a beautiful white colour by heating it red hot, and plunging it into sulphuric acid diluted with water (about four parts of water to one of acid); or it may be boiled in the mixture until it is whitened sufficiently.

Scratch Brushing.—Another useful implement to the brass finisher is the *Scratch Brush*; this is used both by the hand and in the lathe. For use by hand, it is made by cutting a number of fine wires to a uniform length, and binding them tightly round with some of the same wire; if for use in the lathe, it is made in the same way as an ordinary

circular brush. To use it, hold a circular piece of cork, or wood, against it, and the work just below, so that the extreme points of the brush, when the lathe is in motion, may fall upon the article to be operated on. The brush is moistened with beer, size, and other fluids, according to the class of work. This method is much in use amongst jewellers, and produces a nice frosted appearance.

An excellent plan of finishing brass, in great favour in London, is the following: Dip the work, when clean, in aquafortis, and, after washing, and drying in sawdust, sand it carefully; then brush all the sand off, and dip again; now apply the scratch brush, either by hand or with the lathe, using a solution of ½oz. of cream of tartar in ½ gal. of water; dry in sawdust, and lacquer with dark amber lacquer, The work will now have a soft, gilt appearance, which is much admired.

Before dipping or bronzing the work must be freed from grease by boiling in a strong solution of common washing soda.

Parcel Gilding.—If desired, Repoussé Work may be readily silver-plated, or "parcel gilded," which consists in the body of the work being plated, and certain portions gilded. I saw a card tray, not long since, chased with a design of wheat, leaves, and poppies, coloured with gold, silver, and copper, the effect of which was excellent.

CHAPTER IX.

FORMING.

Spinning—Stamped Goods: How Made—Working with the Hammer—Stakes: Side Stake; Beak Iron; Hatchet Stake—Fixing Stakes—Coffee-pot Stand—Trays—Finger Rings—Brooch—Sconces.

It would take a very long treatise to describe, and would lead me altogether beyond the scope of this work, if I were to endeavour to give anything like a detailed account of the various methods employed in manufacturing the numerous articles that come into the chaser's hands to be ornamented, so I shall merely glance at one or two of the most usual.

Spinning.—A great many things having a circular outline are "spun" in the lathe, or gradually worked up out of the flat, by pressing burnishing tools against the pliant metal while it is fixed in the lathe, and so forcing it to take the form of a wooden mould placed against it. Trays, cups, teapots, and many other things of a like character, are made in this way; they come from the lathe very smooth, and in good order for chasing. Stamped goods are pressed into form by dies and counterparts of the required shape; crumb trays are good examples of this kind of work. Of course, unlike spinning, the work may be of any form. The silversmith and coppersmith raise the bulk of their

work with the hammer; in other words, it is forged into shape by a series of blows applied in a circular direction, commencing with the centre of the disk to be raised, and thus gradually compelling it to take the form required. The work is difficult, and requires long practice; but great skill is often brought to bear upon it. I know of one man who made the whole of a copper tea-kettle out of an old-fashioned penny piece, with the hammer alone.

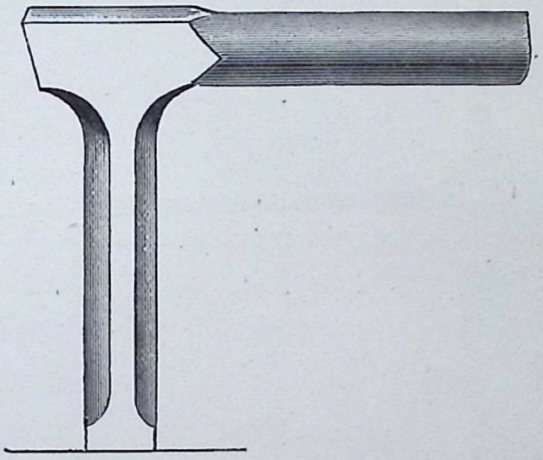


FIG. 34. SIDE STAKE.

Stakes.—Although these methods are beyond the reach of ordinary amateurs, there are many things that may be made with few tools, and by the exercise of ordinary ingenuity. I will first describe some of the most common appliances for working in sheet metal, and then give illustrations to show the method of using them. One of the most useful tools for this work is the **Side Stake** (Fig. 34). A great variety of articles can be worked into shape on this tool, the round or square end being used, as best suits the work. Fig. 35 shows another very

useful tool (the **Beak Iron**), very similar in its uses to the side stake, but intended for work of a smaller size. Tubes of

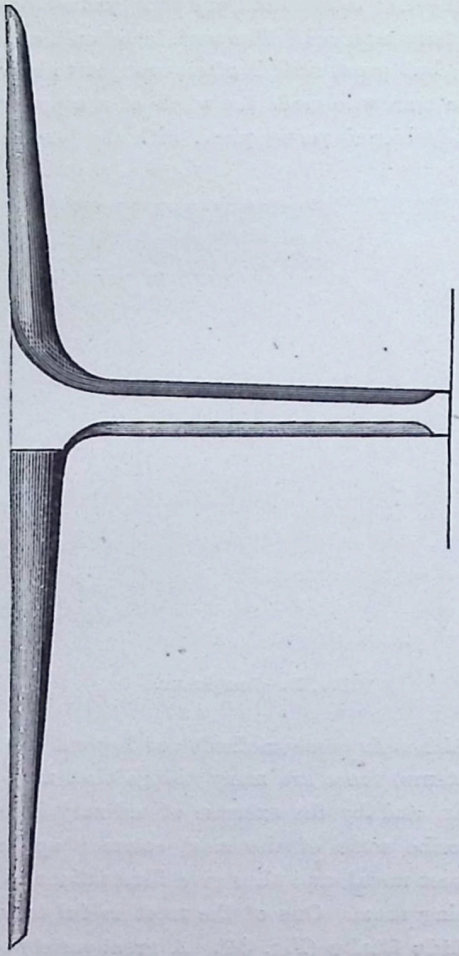


FIG. 35. BEAK IRON.

various kinds, and circular boxes, are made on the round part, and square boxes, &c., on the other end. Fig. 36 is a **Hatchet**

Stake. These tools range from 2in. to 10in. wide on the face, and are very much used for bending sheet metal to a sharp angle, as also for turning over the edge to be afterwards beaten down with the mallet. A variety of anvils with round, square, and oval heads, are required for special purposes, but the foregoing tools are all that the amateur is likely to require, and any special forms could be added as the necessity for them arose.

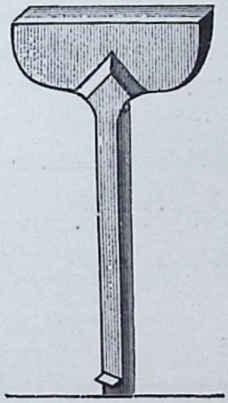


FIG. 36. HATCHET STAKE.

The stakes I have described must be fixed in holes made in the top of a good strong bench or table. My bench is 2ft. 8in. high, 2ft. 6in. long, and 1ft. 9in. wide; the top is 1¾in. thick, and the legs are 3in. square. Along each side is a strip of wood, 1¾in. wide, with holes in it to hold the various hammers, mallets, &c., employed. The top has several holes to receive stakes and such like tools; a tail vice is fixed at one end. As the workman usually stands when at this work, the height of the bench should be regulated to suit the individual.

Coffee-Pot Stand.—The Frontispiece represents a simple thing which may easily be made by almost anyone, and will serve very well for a first essay. It is intended for a coffee-pot stand, and should be, when finished, from 5in. to 6in. square. The design must first be transferred, and the chasing and polishing completed; the form of the feet should also be clearly marked out on the brass with a scriber, taking care that the lines are perfectly square, and the width of the feet precisely similar. The pieces of metal along the sides marked A A A A are first to be cut out with the snips, and the sides turned down; this will bring the two edges of the feet together. To make a neater joint at the point of junc-

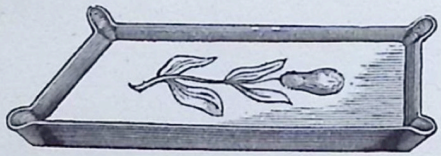


FIG. 37. TRAY.

tion, it is desirable to chamfer, or file off, the inner edges of the feet where they meet; if this is neatly done, and the feet cut quite square, the joint will be hardly perceptible; they should be secured by a solder joint being run down the inside of the joint.

Trays.—The tray shown at Fig. 37 is also within the scope of the amateur; in this case it is better to make the tray before chasing it. To do this, on a piece of brass of sufficient size to allow a margin of about 1in. all round the design, set out with the square and compasses the extreme length and width required, mark out the width of the sides, and turn these and the ends up over the side stake, using the mallet for the purpose. The ears at the corners are to be gradually

formed, as the sides are turned up, by beating them over the extreme end of the round part of the beak iron. If this should be too large for the purpose, they may be formed over a taper piece of round iron held in the vice. It looks better if the points of the corners are rounded off before the sides are turned up.

Round trays with fluted edges, as shown in Fig. 38, look very well. These, also, should be made before they are chased. The

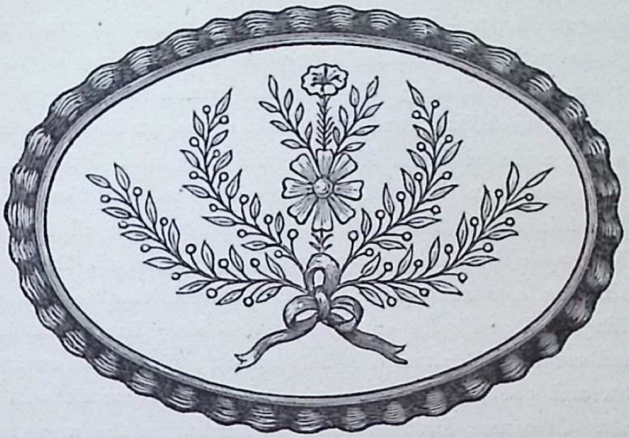


FIG. 38. TRAY WITH FLUTED EDGES.

brass having been cut to the size required, and an inner line marked out with the compasses, giving the width of the sides, divide the edge of the metal into equal spaces the width of the intended flutes; now hold the metal with the thumb and fore-finger of each hand, the thumbs on the upper surface, and one of the marks denoting the position of a flute under each thumb and one between them; press the metal on the end of the beak iron, and the commencement of one flute will be formed. Repeat the operation until all the flutes are slightly raised, and

then go over them again and again until they are sufficiently deep; this is better than trying to make them at once, as any imperfection can be more readily rectified. This plan suits large trays perfectly, but for small ones it is better to bend the flutes with a pair of round-nosed pliers.

In this and the last instance I have given, the work may be done either in flat chasing or *en repoussé*, but the coffee-pot stand should not be beaten up, or the pot will not stand steadily upon it.

Finger Rings.—Rather a pretty illustration of what may be done with the hammer alone is the making a finger ring out of a shilling. To do this, punch a hole in the centre of a shilling, and slip it on the end of a taper mandrel, made of iron. Mine is 8in. long, and tapers from $\frac{7}{8}$in. to less than $\frac{1}{4}$in. Rest the small end on the bench, and, holding the other end in the hand, tap the edge of the shilling with the hammer, turning the mandrel all the time; if this be continued, and due care taken, the hole in the shilling will gradually enlarge, and a ring having a half-round section will ultimately be formed. The blows must be light, and the process a gradual one, or the work will be spoilt. Of course, flat rings may be formed in the same way, though the others, I think, look the best. After they are formed, they may be just skimmed in the lathe, though a clever workman will make a very good job of them with the hammer alone. My readers will find that the fair sex appreciate these rings highly; they like to wear three of them on one finger. If desired, they may be chased after they are made.

Brooch.—Another small article, which the amateur will find to be very much admired, is shown in Fig. 39. This is a silver brooch, in the shape of a ship's steering wheel, made out of a half-crown. To make it a new half-crown should be selected, and the part occupied by the spokes and handles slightly turned

down in the lathe. The spaces between them having been cut out with the piercing saw, they must be rounded up, and finished with needle files. The wreath and crown should be carefully preserved, as seen in the engraving. All that is now required is a brooch pin, to be soldered on to the back; this can be obtained at any jeweller's.

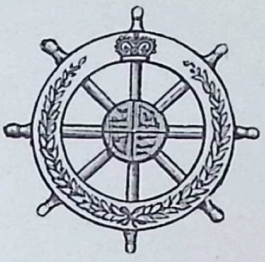


FIG. 39. BROOCH MADE FROM HALF-CROWN.

Sconces.—Brasswork makes an excellent background for sconces; indeed, I do not think this work ever shows to so much advantage as when lighted up at night by candles attached to the front of it. An old-fashioned form of sconce, which was much used when I was a boy, is shown in Fig. 40; the height is 9½in., and the width 4in. The lower part, which holds the candle socket, projects 3in. The socket is made of a piece of brass tube rather more than 1in. long; the under side should be filed away, leaving two projections, or pins, rather more than $\frac{1}{16}$in. long, Two holes must be drilled in the centre of the projecting part to receive these pins, which are to be riveted on the under side by placing the socket on the anvil, and tapping them gently with the pane of a hammer; this will hold the socket quite firmly, and prove much better than soldering, as it cannot be loosened by the heat occasioned by the candle burning down in the

socket. A hole should be made at A, to hang the sconce up by. In case a suitable piece of tubing is not procurable, it will not be difficult to make a socket by bending a piece of brass round the pointed end of the beak iron, and soldering the seam together.

FIG. 40. SCONCE (Old-fashioned Form).

Another and more elaborate form of sconce is shown at Fig. 41. The socket may be made by either of the methods I have just described, and the vandykes cut out with the snips. The tray to which the socket is fastened may be chased and beaten, and the edge turned up with the mallet on the round end of the side stake. This pattern was taken from one in the South Kensington Museum, and is very suitable for attaching to a handsomely worked piece of brass to be framed and hung on a wall. A disk of metal should be

fitted into the bottom of the socket, to hold the wire A, which is screwed into it. In any case where a solder joint shows, and is unsightly, it may be touched with a piece of sulphate of copper, or bluestone, slightly wetted, which will give it a coppery tint, and render it less visible.

If any of my readers should be at a loss how to proceed when they are endeavouring to make an article for themselves, their

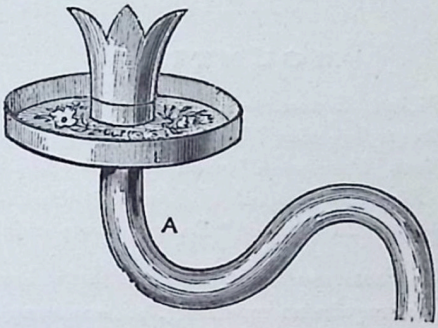


FIG. 41. SCONCE.

best course is to apply to a good tinman, who will soon help them out of their difficulties. A tinman's daily occupation is to form out of thin metal articles of every conceivable shape and form, and he is, consequently, very expert and quick.

CHAPTER X.

MOUNTING.

Staining—Picture Frames—Ebonising: Recipe for—Walnut Stain: Recipe for—Best Woods for Staining—Mounted Brass-work—Plush Frames—Furniture—Fire Screens—Looking Glasses: Elaborate Method of Framing—Portfolio Covers—Bellows—The "Ball-headed" Screw—Screw-making.

MANY articles that pass through the chaser's hands, such as cups, vases, &c., require no mounting, but are complete in themselves. Again, some kinds of brasswork, even when intended solely for ornament, provided they have a border worked on them, will look well, when hung on a wall, without any frame round them. Trays and plaques may be supported by brass wire bent into an angular shape, and hung upon a brass-headed nail.

Staining.—Ordinary gilt picture frames are quite inadmissible for brasswork, and should never be used. If oak be used, picture frames look well, particularly if carved. But the material I generally use, and much prefer, is ebonised wood; this may be either carved or used plain. If carved, the carving should be done first, and the ebonising afterwards. The following is an excellent method of ebonising wood: Boil a handful of logwood chips in a quart of water, until all the dye is extracted. Apply several coats of this dye,

while hot, to the wood, allowing one coat to dry before another is laid on. As soon as the last coat is dry, pay it over with a strong solution of sulphate of iron or copperas; this will turn the wood an intense black. If it is not black enough the first time, the sulphate of iron solution should be applied again. Mr. H. C. Stevens, of 171, Aldersgate Street, London, makes an excellent ebony stain, which merely requires to be laid on the wood with a soft brush, one coat being usually sufficient.

Some very excellent black mouldings, properly prepared, and ready to be made up into frames, are now imported from Germany; these the amateur will find very suitable for his purpose, particularly those that are of a dead black.

Walnut Stain.—A most useful stain, which gives a rich warm brown to frames, is made by dissolving powdered Vandyke brown in a saturated solution of common washing soda. It imparts to any light coloured wood, especially sycamore, a very close resemblance to walnut. When used on oak, it gives it the dark colour produced by age. The relative proportions of the materials used are not of much consequence; the best way is to make it as strong as possible, and dilute it when required for use. I always keep a large bottle of this stain by me, as it comes in useful for a great variety of purposes. If the wood has to be varnished, it must have one or two coats of size as soon as the stain is dry.

The best woods for staining are beech, sycamore, lime, and Honduras mahogany.

I do not purpose to enter into the details of picture-frame making, as it is a difficult art, and holds a very subordinate position with reference to Repoussé Work; I shall therefore confine myself to giving a few hints as to the best style of frames for our purpose.*

* Further particulars as to frame-making may be found in "Picture-frame Making for Amateurs" (L. Upcott Gill, 170, Strand, London).

Mounted Brasswork.—Fig. 42 shows piece of brasswork mounted, with two sconces in front of it. This frame was made of German moulding, 1in. wide, of a reeded pattern, and dead

Fig. 42. Brasswork Fitted with Sconces

black in colour. The crossbars were halved into the sides of the frame—that is, the upper portion of each bar was cut away, and the lower part of the frame recessed to receive it. When these were accurately fitted together they were secured

with wood screws. In cutting the bars, great care should be taken that they are all exactly the same length, or a gap will be left, which will look very unsightly and unworkmanlike.

Plush Frames.—These are made of various shapes, to suit different classes of work. The round ones should be turned in a lathe, and the square and oblong ones framed together, so that the end way of the grain of the wood will not show; this also prevents them from splitting. Elaborate mouldings are not suitable for covering with plush. My readers will find that nothing looks better for this sort of frame than what is called the "thumb mould," from its resemblance to a thumb reversed. After the frame is put together, and made quite smooth with glass paper, the plush, cut to the proper size, can be attached with glue, which must not be too thin, or it will permeate the plush, and completely spoil it. The edges only need glueing, the glue being applied to the frame, and not to the plush. According to my taste, a deep crimson plush suits the colour of brasswork better than any other shade.

Furniture, particularly of the mediæval class, is often greatly improved by the addition of brasswork. Inlaid cabinets, overmantels, and all kinds of articles that are framed together, may with advantage have the panels removed, and brass plates introduced in their stead; if there are wooden knobs, or drawer handles, these should be taken off, and brass ones substituted, so as to keep up the character which the brass panels give.

Fire-screens form another suitable vehicle for Repoussé Work. I should not recommend that the whole screen be formed of brass, as the thin brass, which is most suitable for chasing, would not be substantial enough for this purpose; it is better to make the frame of wood, say walnut or stained sycamore, and introduce a panel of brass on each leaf. A very effective screen, consisting of three leaves, hinged

together with brass hinges, might be made of wood, each leaf to have two panels, the lower one being longer than the upper, and painted with a conventional flower, done in oils; the upper panel should be brass *en repoussé*. Or the screen might be made of deal, covered with plush, with square plates of brass let in from the back. Five plates would be required for each leaf; one somewhat larger than the others should be in the centre, and one at each corner, not too near the outer edge. These frames look better if the leaves are rather wide.

Looking Glasses also afford an excellent opportunity for utilising brasswork. One way of doing this is to cut a piece, ¼in. less each way than the glass to be mounted, out of the centre of the sheet of brass. The edge must be beaten up from the back, so as to form a rebate to receive the glass, which must be held in its place by small strips of metal soldered on the back of the frame. The back may be covered with strong brown paper, or, better still, with thin wood, attached by screws; thin deal is sawn out specially for this purpose, and is called "picture backing." A rather more elaborate method of framing looking glasses is the following: Make a frame, in the ordinary way, of ebonised wood about 1in. wide, with mitred corners, of such a size that the glass will drop easily into the rebate at the back of it; then cut a groove, ⅛in. wide, all round it; this is to receive the edge of the brass plates, and to keep them steady. Four plates must now be fitted round the frame, and another frame, wider than the inner one, made to inclose the whole. If desired, the lower plate may be wider than the others, and two sconces may be fitted into it. This forms a very useful and handsome arrangement. Picture backing should be fitted so as to inclose the whole of the back, and protect the glass from dust and injury. Plate glass with bevelled edges should be used for this looking glass, and can be obtained, of any size, from

Messrs. Houghton & Son, High Holborn, London. I may add, that oblong glasses look better than square ones.

Portfolio Covers.—A variety of small articles may be decorated with brasswork, either inlaid or merely fastened on the surface; portfolio covers are an instance of the former, and bellows of the latter. The wood intended for a portfolio cover (walnut is the best for this purpose) should be about $\frac{3}{8}$in. thick, worked off from the centre to the edges until it is reduced to $\frac{1}{8}$in., and with the edges rounded. The easiest way to fix the brass plate is to cut a rebate in the back of the wood to receive it, having first removed a piece of the cover of sufficient size to allow the part of the plate which has been worked to be seen. It is not advisable for this purpose to use plates worked in very high relief, as the raised parts are apt to have the lacquer rubbed off them when the portfolio is in use, and thus to become unsightly; for this reason, the highest part of the plate should not rise above the level of the surrounding wood. It looks lighter if the edge of the wood, where it surrounds the brass plate, is rounded off a little. Another way of treating portfolio covers is to sink a round medallion into the centre, and put four angular plates a short distance from each corner. In this case I should work the medallion *en repoussé*, and the corners in flat chasing. If the amateur has a lathe of sufficient size, the recess for the medallion may be turned out; otherwise, it must be made with a chisel. The corners look best merely screwed on. It is a great improvement to add imitation strap hinges to the portfolio; these may be cut out of sheet brass, with a piercing saw, chased, and fixed on with ball-headed screws. They should extend about two-thirds of the way across the portfolio, one end being fastened close to the back.

The plates for bellows should cover the whole of one side of

the woodwork, and may be attached with screws. The most suitable screw for this and all similar purposes is the so-called "ball-headed" screw, the head of which forms one-half of a ball; of course, this is not countersunk, but stands out from the surface. The distance between the screws should be uniform, or they will not look well. These screws have a nick in them, and are driven, by a screwdriver, in the ordinary way; they should, of course, be of brass.

When a sconce has to be fastened on to a brass plate, it is necessary to use small screw pins, with a nut on the back side of the plate. These can easily be procured at most tool shops, or of the makers of model engines. A screw $\frac{1}{8}$in. in diameter is quite large enough for amateurs' purposes.

Screw-making.—As some amateurs might like to make their own screws, I will give a short account of the readiest method of doing so. A piece of stout, brass wire, long enough to cut into several screws, is fixed into an American self-centreing chuck. A die, having radial teeth, and a centre hole of the size of the screw intended, is then placed against the dead centre in the poppet head. The die is now advanced cautiously against the wire running in the lathe head, and the wire rapidly reduced to the required diameter. As soon as a sufficient length has been cut, the die is removed, and the thread is cut with small stocks and dies; it only remains to cut the screw off, and round up the head, by giving it a few touches with a turning tool. The only precaution required is to taper the wire slightly, so that it may enter the hole in the die with ease. The nick in the screw may be cut with an ordinary metal saw, the pin being held in a vice during the operation. If many screws have to be cut, it is better to cut them with a small cutter (which is sold for the purpose) running in the lathe.

CHAPTER XI.

DESIGNS AND DESIGNING.

Designs: Choice of; Most Suitable—American Designs—"Pounding Brass"—Japanese Designs—English Designs—Transferring the Design—Carbonic Paper—Tracings—Enlarging and Reducing Designs—Proportional Compasses—The Pentagraph: How to Make; How to Use—Tracing Easel—Designing: List of Necessary Instruments for; A Knowledge of Mechanical Drawing and Practical Geometry Necessary for—Where to Find Designs—Position of the Hand in Designing—The Kaleidoscope a Valuable Instrument for the Designer—The Standard Work on Designing—How to Sharpen Lead Pencils—Conclusion.

In this chapter I propose to give some hints as to the designs most suitable for Repoussé Work, where to obtain them, and how to draw or copy them, as also a few words on original designing.

DESIGNS.

Choice of Design.—It is not every kind of design that looks well when cut on brass, so that the amateur should take some little trouble in selecting his subjects. An amateur once informed me, with much pride, that he had chased, on a large tray, a view of his residence and the surrounding landscape, and seemed rather surprised when I told him that he could hardly

have chosen a worse subject. Birds, animals, or flowers, particularly when more or less conventionalized, form good subjects, and especially so when worked in relief. Arabesque scrolls, interspersed with grotesques, form an endless mine for the artist in metal to draw from. For flat chasing, geometrical patterns, especially those which are called "all over" patterns, look, to my taste, as well as any.

For the advanced student, I should recommend heads and figures, which, to do them justice, should always be in relief, though this need not necessarily be high; indeed, I am disposed to think that, the lower the relief, the better the effect produced, assuming, of course, that the relative heights of the various parts are properly preserved. An examination of good coins or medals will show how much can be done in this direction. The amateur will find that it is more difficult to work in low than in high relief, as, the gradations between the different parts being less, the difficulty of keeping every part in due proportion is greater.

American Designs.—Demand always creaes supply, and the number of workers *en repoussé* having greatly increased during the last few years, the publication of designs suitable for this work has increased in a corresponding ratio. The Americans, being very active just now in what they term "pounding brass," have published several series of designs. The best sets I have met with are by Charles Leland, a well-known writer on art work; these sets are published by William Whitlock, 140, Nassau Street, New York, and include designs suitable for a great variety of subjects, and seem to be intended principally for the rough work on wood or lead, or for flat chasing. Some of them are very quaint and original, and would form good practice for a beginner. Messrs. Goodnow & Wightman, of 176, Washington Street, Boston, U.S., also publish a large váriety of suitable designs.

Japanese Designs.—Many Japanese books are full of drawings of birds, &c., of great vigour and excellence, which might be easily utilised by anyone having sufficient knowledge of drawing to enable him to adapt them to the article he wishes to decorate; this would form a sort of intermediate step between using a ready-made drawing and making an original one, and would prove very helpful to the amateur artist.

English Designs.—*The Art Designer*, published quarterly by John Heywood, 11, Paternoster Buildings, London, contains some really beautiful designs by distinguished artists, many of which are specially intended for metal-work; and others, though designed for china painting, look equally well on metal. I would again recommend my readers to study well the metal-work at South Kensington, and to make sketches of some of the best examples to be found there. If they do so, they will find it very helpful in acquiring a thorough knowledge of the art, and the way it should be carried out. On the whole, the best and most artistic modern designs I have met with were those made by Mr. T. J. Gawthorp, 16, Long Acre, London; for originality of design and vigour of treatment they are unequalled, and, being made by a practical man, are perfectly adapted to the intended purpose. The designs I have used were those intended for advanced pupils, and were made expressly for me; but I understand that Mr. Gawthorp supplies drawings to suit every class of worker, from the merest novice onwards.

Transferring the Design.—Having obtained a suitable design, the next thing is to transfer it to the brass plate. I have already described the best method of doing this, which is by placing a piece of carbonic paper between it and the plate, and going over the outline carefully with a hard pencil or tracing point. If the surface of the brass be curved—as the sides of a vase, or the bottom of a cake basket—it will be

found impossible to keep the drawing in its place by weighting it; the best way to get over this difficulty is to attach the design by small pieces of modelling wax, placed at each corner. If the design itself is too valuable to be treated in the manner I have described, a careful tracing should be made from it, and transferred to the metal in the usual way. Great care should be exercised in transferring, or a large portion of the beauty of the original will be lost. It has been said that "it is easier to draw than to trace." Without altogether endorsing this statement, I must say, that to make a good tracing is far more difficult than anyone who has not tried it would imagine. Numberless tracings made by amateurs have passed through my hands, and most of them, I am sorry to say, were fearful productions, nearly all of them requiring re-drawing before any use could be made of them. There is almost sure to be—except in very skilled hands—some loss of effect in making a tracing from a drawing; amateurs should, therefore, by the exercise of great care, endeavour to make the loss as small as possible. It is better to use tracing cloth than tracing paper, as the latter will not stand any rough usage. The paper on which some of the American designs are printed would, if it were procurable, be excellent for tracing purposes, as it combines, with the toughness and durability of the best writing paper, the transparency of tracing paper.

Enlarging and Reducing Designs.—It not unfrequently happens that a design otherwise suitable to the amateur's purpose is either too large or too small for the surface to be decorated, and has, therefore, to be reduced or enlarged. A ready method of doing this is by drawing a square around the design in pencil, and dividing it vertically and horizontally into a number of smaller squares. Then describe another square having the relative proportion to the first square that may be

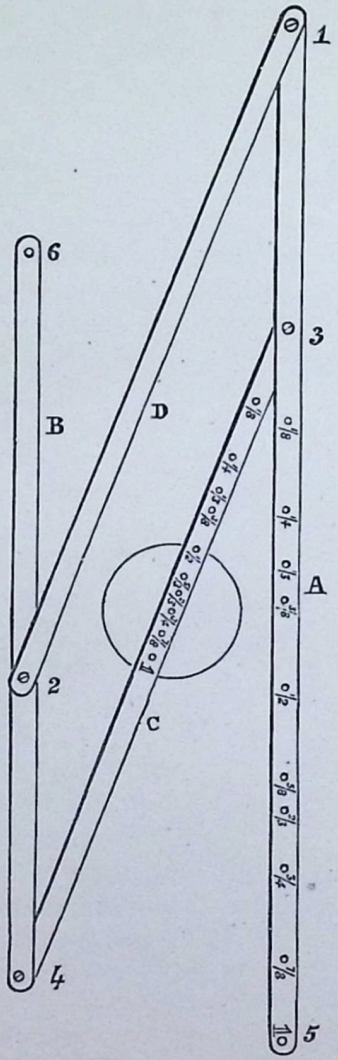


FIG. 43. THE PENTAGRAPH.

desired. This latter square must also be divided, by horizontal and vertical lines, into the same number of squares as contained in the original square. The lines in both squares should be numbered with corresponding numbers. By observing carefully where each square is cut by the lines of the drawing, it will not be found difficult to copy the original inside the second square. Proportional compasses, having two working ends, which are capable of being set so as to bear a definite relation to one another, are a great help in this work, and tend much to the accuracy of the result. The amateur must use his own judgment as to the number of divisions necessary to divide the squares into; suffice it to say that, the larger the number, the more accurately the work can be done, though, being more complicated, it becomes, of course, more difficult. This plan will be found useful by those who do not possess drawing instruments.

The Pentagraph.—As the plan just described is tedious, and by no means too accurate, I do not employ it myself, but reduce or enlarge by means of the pentagraph, an instrument specially designed for the purpose. If money is no object, the amateur can readily purchase one of these at any mathematical instrument maker's. As the price, however, is high, ranging from between £7 and £8 to £14, it is very probable that he may hesitate before doing so. I will therefore describe one which I made myself, and which answers its purpose perfectly. Fig. 43 shows the instrument ready for use. It consists of four wooden bars—A, B, C, and D, A and C being graduated. Mine is graduated by eighths, from $\frac{1}{3}$ to 1. I have also one-thirds and two-thirds marked on it. At each graduation a hole is drilled. The arms B, C, and D, are exactly 18in. long, measuring from the pinholes on which they work; the arm A is 18in. in length from the pin 3 which connects it with the arm C to the centre of the hole 5. The

pentagraph is supported on a brass pin with a screw (A) to keep it steady, cast into a heavy lead weight (Fig. 44). To make the instrument, plane up accurately the four arms out of a clean, dry piece of beech, until they are $\frac{5}{8}$in. wide and $\frac{5}{16}$in. thick; then drill the pinholes 1, 2, 3, 4, 5, 6, which should be done with an American twist drill, and not

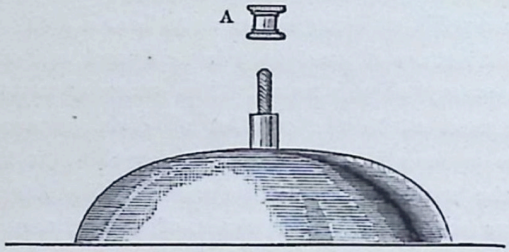


Fig. 44. Lead Weight.

with a gimlet, as accuracy in the size of the holes is of great importance. The position of the holes must be set out with great care, or the instrument will not work correctly; $\frac{3}{16}$in. is a convenient size for the holes. Now make four

Fig. 45. Brass Pin.

brass pins (Fig. 45), in the way I have described on page 90, so that they shall fit the holes drilled in the arms easily, yet without any shake; only one-half of each pin should be tapped. The holes in the lower arm, at the places where they are joined together, should now be drilled and tapped;

of course, these holes must only be made of sufficient size to allow of the tap cutting a full thread. The graduations on arm A must be one-eighth, one-quarter, &c., of the length from hole 3 to hole 5—that is, 18in. The arm C must now be graduated; to do this, stretch a thin piece of cotton from the centre of the hole marked 6 to the centre of the hole marked $\frac{1}{8}$th on arm A, and which should be the hole nearest to the arm C. Make a mark at the point where the cotton crosses the arm C, and drill the first hole there, marking this as $\frac{1}{8}$th. Proceed with all the holes on the arm A in the same way, and the instrument, when screwed together, will be complete.

To use the pentagraph, say for reducing a drawing to three-fourths of its original size, place it on a smooth table, or drawing board of sufficient size, the centre pin, in the weight on which it works, having been inserted in the hole in arm C marked $\frac{3}{4}$. Insert a blunt tracing point in hole 6, and a sharply-pointed pencil in the hole marked $\frac{3}{4}$ on arm A. Place the design to be copied under the tracing point, and a sheet of clean paper under the pencil. If the tracing point be now carefully passed over every line of the drawing, the pencil will make an accurate copy exactly three-fourths the size of the original. The tracing point, centre pin, and pencil, must always be in a straight line. If the pencil does not mark sufficiently, a few coppers may be placed on the arm A. By putting the pencil in hole 6, and the tracing point in one of the holes in arm A, the instrument will make an enlarged copy. Some practice is required to work a pentagraph well, but the instrument will be found most useful when once the necessary skill is acquired.

Tracing Easel.—If much tracing is likely to be done, it may be worth while to have a tracing easel, which is a sheet of glass, surrounded by a frame of wood, with folding

props attached to the frame, so that it may stand at about an angle of 45degs. The easel, when in use, should be placed in front of a window. The drawing to be copied should be covered with a sheet of paper, and both secured to the glass with small pieces of wax. By the use of this easel tracings can be made with great accuracy and despatch.

DESIGNING.

If any of my readers think of making designs for themselves, they will have to procure some instruments for the purpose; these need not be either numerous or costly.

The following will at least be necessary:—

A pair of compasses with movable pen and pencil joint.

A pair of dividers.

Blacklead pencils (H and HB).

A drawing pen, for ruling lines.

A set of drawing scales.

Two set squares.

Drawing pins, for fastening paper to the drawing board.

A rolling parallel ruler.

It is useless for anyone to attempt designing until they possess some knowledge of mechanical drawing and practical geometry. This will be very evident at the first attempt. Suppose, for instance, our object be to design a pattern for a waiter. The first thing necessary would be to strike out a circle of the same size as the centre of the waiter, and then to divide it into a number of equal parts, say eighteen, by lines radiating to the centre. Or, if the pattern required were elliptical, an ellipse of given dimensions would have to be drawn and divided, as a groundwork on which to found the design. It is beyond the scope of this work to go into detail on these subjects, so that all I can do for my readers

is to indicate where the required information may be found. I can specially recommend a little book by John Carroll, entitled, "Practical Geometry for Art Students"; this is a thoroughly useful and practical work, and contains instructions which will enable the student to draw a figure of any form he may require, or to divide either a curved or straight line into any number of equal parts. After what I may term the skeleton of the design has been drawn by the aid of compasses, &c., it may be comparatively easily ornamented by attaching leaves and offshoots to it, and interspersing them with faces, grotesques, &c.

It is not uncommon in mediæval decoration to find such scenes as a hunt or tournament, fox watching poultry, &c., mingled with scrolls and conventionalised foliage and vegetation. Many serial works now published have ornaments at the beginnings and endings of the various chapters; in many cases these are copies of, or adaptations from, the antique, and my readers will find them very suggestive. The old missals in the British Museum, and elsewhere, will afford excellent hints to the artist, being full of quaint figures and conventionalised foliage very suitable for reproduction on brass; dragons especially may be used with much success entwined with scrolls, into which they often merge altogether.

In designing scrolls, or bold designs, the hand should not rest on the paper. The pencil should be held with the thumb and first and second fingers only, the hand being over it; then, with a bold sweep, dash in very lightly the rough outlines of what you want to produce. The shoulder, and not the wrist, or elbow, should be the pivot on which the pencil should turn. At first nothing more should be aimed at than to get the positions of the main lines of the design; having got these roughly, they can be corrected by degrees, until all the curves run smoothly, and without flat places in them; the

detail can then be filled in. My readers will be surprised at the vigorous drawings they will be able to make, after a little practice, by this method.

The Kaleidoscope is a very valuable instrument to the designer, and the basis of many a good design has been got from it; but it should not be too closely adhered to. Free-hand additions should always be interspersed with the formal lines the instrument gives, so as to avoid stiffness.

The mere repetition of a suitable object will often produce a pleasing design. To prove this, take two pieces of looking glass, about 3in. wide, and hinge them together, by paper pasted at their backs, so that they may open like a book; stand them upright on a table, and place between them a small sketch, say of a conventional flower. The figure formed by the repeated reflections will at once give pleasure to the eye, thus showing that repetition is one of the first principles of decorative design.

Owen Jones' "Grammar of Ornament" is still the standard work on design, and the student will do well to consult it. The original price was so high as to place it beyond the reach of most people, but I understand that it has been published lately by Quaritch, 15, Piccadilly, London, at a much more reasonable rate. I would also specially recommend to my readers Hulme's "Suggestions in Floral Design," published by Cassell & Co. This is one of the most beautiful and suggestive works I know of, and cannot fail to be of great use to the student. It consists of a multitude of designs, of great variety, founded on conventionalised floral forms. Many of the borders given might well be transferred to metal, especially in flat chasing, without any alteration whatever.

It may seem but a small thing to mention, but few people know how to sharpen a lead pencil properly. The best way to proceed is first to cut away a sufficient quantity of the wood

with a penknife, and then to sharpen the point by rubbing it gently on a piece of fine glass paper, or a fine file. A much better point will be obtained by this means, and the pencil will last much longer; it is especially useful for very hard pencils, which are very difficult to bring to a sharp point with a knife alone.

In conclusion, I must remind my readers that "what is worth doing at all is worth doing well." If they take up the art hastily and carelessly, they must not be surprised if they fail; but, on the other hand, if they use due care and perseverance, learning patiently each part of the process before they proceed to another, they will be surprised how soon success will attend their labours.

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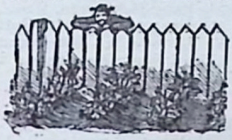

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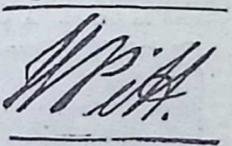

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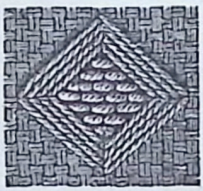

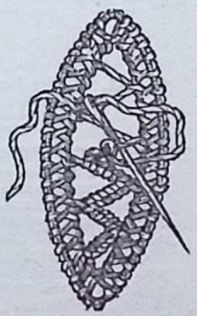

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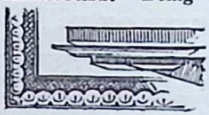

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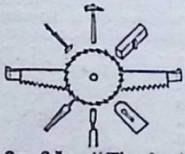

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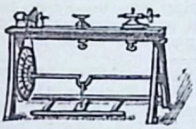

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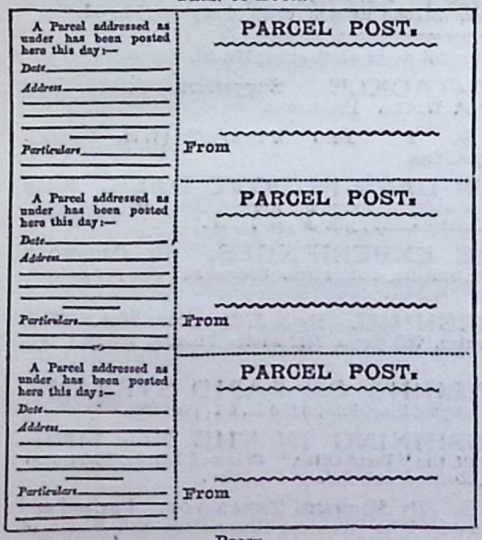

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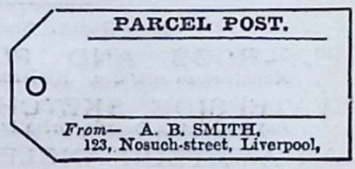

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